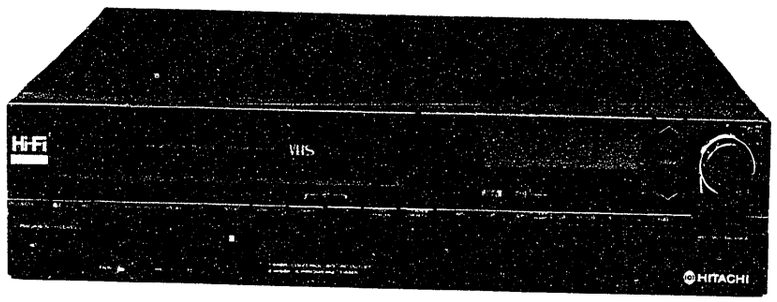
VT-78AY

HITACHI
SERVICE MANUAL

TK | No. 2347E

VT-78AY

Technical Data



VHS

THIS VIDEO DECK IS A VHS TYPE VIDEO RECORDER.
FOR PROPER OPERATION, ONLY THE VHS TYPE CASSETTE MUST BE USED.

VT-78AY

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

VIDEO CASSETTE RECORDER

September 1985 **TOKAI WORKS**

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CHAPTER 1

SAFETY PRECAUTION

SAFETY PRECAUTIONS

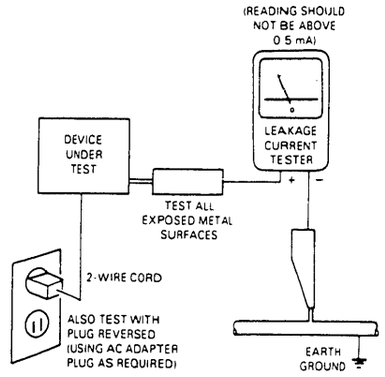
NOTICE: Comply with all cautions, and safety related notes located on or inside the cabinet and on the chassis.

1. When replacing a chassis in the instrument, all the protective devices must be put back in place, such as barriers, non-metallic knobs, adjustment and compartment convershields, isolation resistor-capacity, etc.
2. When service is required, observe the original lead dress. Extra precaution should be taken no assure correct lead dress in the high voltage circuit.
3. Always use the manufacturer's replacement components. Especially critical components as indicated on the circuit diagram should not be replaced by other manufacture's. Furthermore where a short circuit has occurred, replace those components that indicate evidence of overheating.
4. Before returning a instrument to the customer, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock, and be sure that no protective device built into the instrument by the manufacturer has become defective, or inadvertently defeated during servicing.

Therefore, the following checks should be performed for the continued protection of the customer and service technician.

Leakage Current Cold Check
With the AC plug removed from the AC 120V, 60 Hz source, place a jumper across the two plug prongs. Turn the AC power switch on. Using an insulation tester (DC 500V), connect one lead to the jumpered AC plug and touch the other lead to exposed metal part (antennas, screwheads, metal overlays, control shafts, etc.), particularly any exposed metal part having a return path to the chassis. Exposed metal parts having a return path to the chassis should have a minimum resistor reading of 0.3MΩ and a maximum resistor reading of 5 MΩ. Any resistor value below or above this range indicates an abnormality which requires corrective action. Exposed meter parts not having a return path to the chassis will indicate an open circuit.

Leakage Current Hot Check
Plug the AC line cord directly into a AC 120V, 60 Hz outlet (do not use an isolation transformer for this check). Turn the AC power switch on. Using a "Leakage Current Tester", Measure for current from all exposed metal parts of the cabinet (antennas, screwheads, metal overlays, control shaft, etc.), particularly any exposed metal part having a return path to the chassis, to a known earth ground (water pipe, conduit, etc.). Any current measured must not exceed 0.5 mA.


(READING SHOULD NOT BE ABOVE 0.5 mA)
DEVICE UNDER TEST
LEAKAGE CURRENT TESTER
TEST ALL EXPOSED METAL SURFACES
2-WIRE CORD
ALSO TEST WITH PLUG REVERSED (USING AC ADAPTER PLUG AS REQUIRED)
EARTH GROUND

AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE RECEIVER TO THE CUSTOMER.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts have special safety-related characteristics. These are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.
Electrical components having such features are identified by making with a ⚠ on the schematics and on the parts list in this Service Manual.
The use of a substitute replacement component which does not have the same safety characteristics as the HITACHI recommended replacement one, shown in the parts list in this Service manual, may create shock, fire or other hazards.
Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current HITACHI Service Manual. A subscription to, or additional copies of, HITACHI Service Manual may be obtained at a nominal charge from HITACHI SALES CORPORATION.

FOR CANADA

CAUTION AGAINST FUSE REPLACEMENT

FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE ONLY WITH SAME TYPE AND SAME RATING FUSE IN ACCORDANCE WITH THE FUSE SYMBOL LABEL.
The following is the indication of the fuse symbol label which is affixed adjacent to the fuse in the equipment.

*Example

This symbol indicates Fast Operating Type 2A, 250V Fuse.

COMPARISON WITH CONVENTIONAL MODEL

Item	VT-78AY	VT-87A	VT-86A
Heads on cylinder (Helical scan heads)	4-head SP Normal video: 2 LP/EP Normal video: 2 FM-Audio: 2	7-head SP Normal video: 2 LP/EP Normal video: 2 FM-Audio: 2 Trick video: 1	4-head Normal video: 2 FM-Audio: 2
Fixed Audio Head & Record/Play Processing	L/R independent Record: Stereo Play: Stereo	Same as on left "Tape in Indicator"	L/R independent Record: Stereo Play: Stereo
Cassette Loading	Front loading with "Cassette In" indicator	Same as on left	Front loading with "Cassette In" indicator
Tape Remaining	Not proi	Remaining time indication by OSD	Not provided
Motors	4 motors: Single phase DD cylinder motor DC capstan motor DC loading motor DC cassette loading motor	5 motors: 3-phase brushless DD Cylinder motor 3-phase brushless DD Capstan motor 3-phase brushless DD Reel motor DC loading motor DC cassette loading motor	4 motors: Single phase DD cylinder motor DC capstan motor DC loading motor DC cassette loading motor
Recording Tape Speeds	3 speeds (SP/LP/EP)	Same as on left	Same as on left
Still Slow play Frame advance Double speed play Visual Search Reverse play	Field still Impossible Possible Impossible Field search SP (X3), EP (X10) Impossible	Same as on left Variable slow play with slow Tracking control Controlled from the remote hand unit Impossible Frame search SP (X3), LP (X6), EP (X9) Impossible	Same as on left Impossible Impossible Impossible Field search SP (X3), EP (X10) Impossible
Program index	Impossible	Possible	Impossible
Timer Recording	4 programs/2 weeks	8 programs/1 year (by 100-year Calender time μP)	4 programs/2 weeks
Remote control (Number of buttons)	14-mode wireless (10 buttons)	34-mode wireless (29 buttons)	14-mode wireless (10 buttons)
Timer Backup	30 minutes	60 minutes	30 minutes
Heater	Provided	Provided	Provided
Dew Sensor	Not provided	Provided	Not provided
Pause 5 Minutes Timer	Provided	Provided	Provided
IRT (Instant Recording Timer)	Provided	Provided	Provided
CATV	Provided	Provided	Provided
Picture Control	Not provided	Provided (during playback)	Not provided
OSD Function	Not provided	• Clock Setting • Timer Record programming • Tape Counter/Remaining time • Clock, Date • Operation mode • Channel. AFC. Band	Not provided

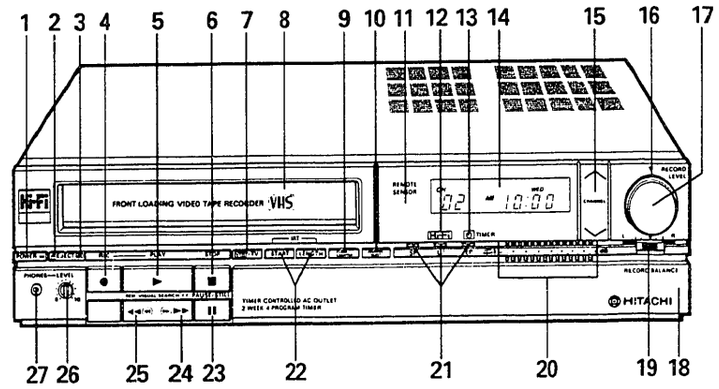
Item	VT-78AY	VT-87A	VT-86A
Noise Reduction for FM audio	PNR	Same as on left	Same as on left
Input Selection	Tuner/Simulcast/Aux.	Same as on left	Tuner/Simulcast/Aux.
Record Level Control	Rotary Control (Rec. Balance)	L/R independent slide control	Rotary Control (Rec. Balance)
ALC	With ON/OFF switch	Same as on left	With ON/OFF switch
Output Level Control	Rotary control	Same as on left	Rotary control
Hi-Fi Indicator	Provided	Provided	Provided
Level Indicator	1-sec peak hold digital indicator	2-sec peak hold digital indicator	1-sec peak hold digital indicator
Normal/Auto Audio Selector	Provided	Auto/Mix/Linear	Provided

SPECIFICATIONS

Recording:	Rotary two head Helical Scan Azimuth Recording
Video:	NTSC Color EIA Standard
Cassette:	VHS Type
Heads:	4 video heads 2: for SP, 2: for LP/EP
	2 Hi-Fi audio heads
	1 Full track audio/video erase head
	1 Combination head for control track, audio erase and audio record/play (3 heads/single housing)
Tape Speed:	33.35 mm/sec (SP), 16.67 mm/sec (LP), 11.12 mm/sec (EP)
Tape Width:	12.7 mm
RF Output:	Channel 3 or Channel 4
RF Input:	VHF 75 ohm, UHF 300 ohm
Tuning Range:	VHF Low channels 2 ~ 6 (54 MHz ~ 88 MHz)
	CATV Mid channels A-5 ~ I (88 MHz ~ 174 MHz)
	VHF High channels 7 ~ 13 (174 MHz ~ 216 MHz)
	CATV Super channels J ~ W (216 MHz ~ 300 MHz)
	CATV Hyper channels W+1 ~ W+23 (300 MHz ~ 438 MHz)
	UHF channels 14 ~83 (470 MHz ~ 890 MHz)
Video Input:	1 – 2 Vp-p 75 ohm Unbalanced
Video Output:	1 Vp-p 75 ohm Unbalanced
Video Recording S/N:	Better than 46 dB (SP), Better than 43 dB (LP), Better than 40 dB (EP)
Horizontal Resolution:	240 lines (SP), 230 lines (LP), 230 lines (EP)
Audio	
Input:	316 mV rms (–7.8 dB) 100 kohm
Output:	Line: 316 mV rms (–7.8 dB) 600 ohm
	Headphone: 8 ohm 3.5 mmϕ
S/N Ratio:	42 dB (SP)
Frequency Range:	100 Hz to 8 kHz (SP)
Hi-Fi Audio	
Frequency Range:	20 Hz to 20 kHz
Dynamic Range:	More than 80 dB
Wow and Flutter:	Less than 0.005% WRMS
Power Input:	AC 120V 60 Hz
Power Consumption:	46W Nominal
Cabinet Size:	17-1/8"(W) x 3-7/8"(H) x 14-7/16"(D)
	43.5(W) x 9.9(H) x 36.6(D) cm
Weight:	19.4 lbs (8.8 kg)
Accessories:	1 – Coaxial cable with F-type connectors
	1 – UHF twin lead
	1 – Matching transformer 300 – 75 ohm
	1 – Matching transformer 75 – 300 ohm
	1 – Infrared remote control unit
	2 – Batteries
	1 – Adjustment screwdriver

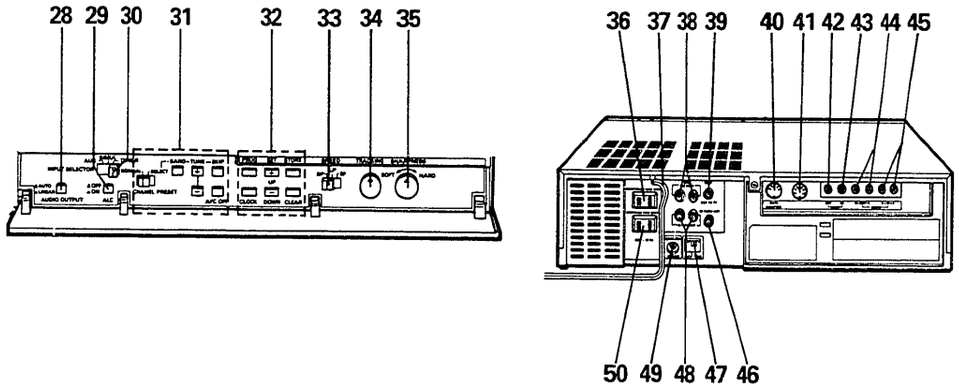
Design and Specifications subject to change without notice.

CONTROLS AND FEATURES



1. **POWER SWITCH**
   Turn system power on and off.
2. **EJECT BUTTON**
   With power on, press to remove cassette.
3. **TAPE-IN INDICATOR**
   Lights when cassette is located in the compartment.
4. **RECORD BUTTON**
   Press RECORD button and while holding RECORD, press PLAY button to record.
5. **PLAY BUTTON**
   Press to start play.
6. **STOP BUTTON**
   Press to stop tape. The STOP button must be pressed between "RECORD" and any other operation.
7. **VTR/TV SELECT SWITCH**
   Selects the signal to be viewed.
   The VTR indicator comes on when the unit is in VTR mode and the signal received by the VTR is displayed on the TV screen. With the switch in the TV position (indicator light off) the broadcast signal is received directly by your TV set. When the VTR power is turned off, the VTR automatically switches to "TV".
8. **CASSETTE COMPARTMENT**
9. **CLOCK/COUNTER SELECT BUTTON**
   Press to select clock display or counter display.
10. **COUNTER RESET BUTTON**
    To reset counter to "0000".
11. **INFRARED RAY RECEIVING SECTION**
    Receives the infrared ray from remote control unit.
12. **Hi-Fi INDICATOR**
    Lights when playing back tapes recorded with Hi-Fi VHS sound.
13. **TIMER INDICATOR**
    Will light when turning power off after programming.
14. **ELECTRONIC DIGITAL DISPLAY**
    This display is used as an indicator for the present time of day, channel number, tape counter, timer programming and instant recording.
15. **CHANNEL SELECT BUTTONS**
    Select the channels you wish to view or to record by pressing these buttons.
16. **MEMORY MARKER**
    When adjusting the recording level manually, adjust the Recording Level Control for optimum recording level, then turn this MARKER to the same position as the control's setting.
    When adjusting the recording level manually next time, simply turn the Recording Level Control to the MARKER's position, you can obtain the optimum recording level.
17. **RECORDING LEVEL CONTROL**
    When recording with the ALC switch off, adjust the control so that 3 red segments light occasionally (during especially loud portions).
18. **DOOR FOR SECONDARY CONTROLS**
19. **RECORD BALANCE CONTROL**
    When recording with ALC switch set to off, adjust this control for left and right sound balance. At all other times leave it in the center position, which can be found as a small detent in the movement of the knob.
20. **RECORDING LEVEL INDICATORS**
    Shows the peak input level of each audio channel during recording and the recorded levels during playback.
21. **TAPE SPEED INDICATORS**
22. **INSTANT RECORDING TIMER BUTTONS (IRT)**
    IRT allows unattended recording without programming the timer. See page 12 for details.
23. **PAUSE/STILL BUTTON**
    Press to pause during recording or playback.
24. **FAST FORWARD/VISUAL SEARCH BUTTON**
    Press to activate fast forward.
    Press this button during playback of a recorded tape, and forward playback picture at high speed can be seen.
25. **REWIND/VISUAL SEARCH BUTTON**
    Press to start rewind.
    Press this button during playback of a recorded tape, and reverse playback picture at high speed can be seen.
26. **LEVEL CONTROL**
    Adjust the sound level from the headphone.
27. **PHONES SOCKET**
    Plug in a stereo headphone for private listening.

CONTROLS AND FEATURES



28. AUDIO OUTPUT SWITCH
Set the switch to "AUTO" for automatic selection of Hi-Fi VHS sound recorded on the tape. To play back only linear audio track, set the switch to "LINEAR".
Note: When Hi-Fi VHS sound is played back, Hi-Fi indicator lights up.

29. AUTOMATIC LEVEL CONTROL (ALC) SWITCH
When in the ON (depressed) position, the recording level is controlled automatically. Release the switch (OFF position) to manually adjust the recording level.

30. AUX/SIMUL/TUNER SELECT SWITCH
In the TUNER position the VTR will record programs using the built-in tuner. In the SIMUL position the VTR will record the audio signals from the AUDIO IN jacks and video signal from the built-in tuner. In the AUX position the VTR will record audio and video signals from the AUDIO IN/VIDEO IN jacks.

31. CHANNEL PROGRAMMING CONTROLS
Program channels for channel up and down selection with these controls.

32. TIMER CONTROLS

33. TAPE SPEED SELECT SWITCH
Recording time using Cassette tape T-160:
EP: 8 hours
LP: 5.3 hours
SP: 2.6 hours
Note: Playback speed automatically corresponds with recorded speed.

34. TRACKING CONTROL KNOB
To minimize noise in playback.

35. SHARPNESS CONTROL
Adjusts for a pleasing level of picture sharpness.

36. UNSWITCHED AC OUTLET
Power is available whenever the VCR is plugged in. Maximum load is 300 watts.

37. POWER CORD
Connect to a 120V AC outlet.

38. UHF ANTENNA OUTPUT
Connect these terminals to the UHF antenna terminals on the back of the TV.

39. VHF ANTENNA OUTPUT
Connect this terminal to the VHF antenna terminal on the back of the TV.

40. CABLE ADAPTER JACK
Connection for external antenna switcher (for cable/game/disc).

41. MTS ADAPTER JACK
Connect an optional MTS adapter.

42. VIDEO OUT
For connection to monitor TV.

43. VIDEO IN
Receives video signal from a video camera or another VTR.

44. AUDIO OUT
For a connection to a monitor, your stereo system or another VTR.

45. AUDIO IN
Receives audio signals from a video camera, external sound equipment or from another VTR.

46. VHF ANTENNA INPUT
Connect the VHF antenna to this terminal.

47. RF CONVERTER SWITCH
Set this switch to whichever channel (CH3 or CH4) is unused in your area.

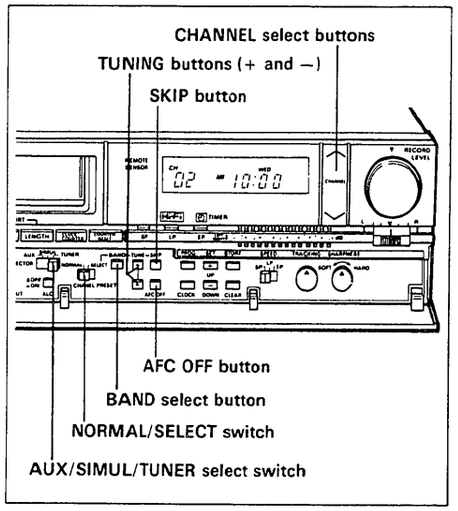
48. UHF ANTENNA INPUT
Connect the UHF antenna to these terminals.

49. CAMERA PAUSE JACK
Connect Camera Pause cable.

50. SWITCHED AC OUTLET
Power is available when the VTR is on. Maximum load is 200 watts.

CHANNEL TUNING

Your VTR can be preset for up to 80 memorized channels. It has been preset to receive VHF channels 2 through 13 when shipped. The channel number in the display will originally match the actual TV channel selected. During the procedure which follows, you can reprogram any display channel number, so that it selects any actual TV channel. This means that after programming of the memorized channels, the display can indicate a different number than the actual TV channel tuned by that channel memory position.
You can set any channel memory position to receive any station. This ability is most useful when the tuner is used in CATV installations. To add UHF or CATV channels not factory preset, or to preset the VHF channels in some other order, use the procedure which follows.



1. Turn on the TV and VTR.
2. Set the TV to Channel 3 (or 4). (for your video channel)
3. Set the RF converter switch of VTR to channel 3 (or 4).
4. Open the door for secondary controls.
5. Set the AUX/SIMUL/TUNER select switch to "TUNER".
6. Set the NORMAL/SELECT switch to "SELECT". Time indication will change to band indication.
   Note: When the NORMAL/SELECT switch is set to "SELECT", the VTR/TV select switch is switched to the VTR mode automatically.
7. Select the channel number to be memorized by pressing the CHANNEL select buttons.
   Note:
   1. Your VTR can use the following numbers as TV channel presets: 00, 01 through 72, 91, 92, 95 through 99.
   2. Your VTR has been preset to receive VHF channels 2 through 13.
   3. You should determine which channel memory positions have not been preset before entering programming information.
      New information automatically erases previous programmed data.
8. Press the BAND select button to select either "L", "H", "C" or "U" according to the channel number as listed below.

Indication on display	Channnels to be received	
L	VHF low channels	2~6
H	CATV channels VHF high channels	A-2, A-1 and A~I 7~13
C	CATV channels	J~W
U	UHF channels	14~83

For example, if you're going to tune one of UHF channels 14 through 83, display the letter "U" by pressing the BAND select button.

9. Press and hold the TUNING button (+) until the picture for the channel number you are programming appears on the TV screen. (For fine tuning tap on the (+) and (–) TUNING buttons alternately.) The active channel with lowest frequency in the band will first appear, followed in sequence by the other active channels, as in the "Channel frequency spectrum" on next page.
   Note:
   1. Holding down the TUNING button (+) at the end of band will result in tuning into the next band. The band display will change to the next higher band.
   2. If you press the TUNING button (–) at first, the band will change to adjacent band immediately. The active channel with the highest frequency in the band will first appear, followed in opposite sequence by the other active channels.
   3. Speeds of picture scanning from the lowest channel to the highest in each band are as follows;

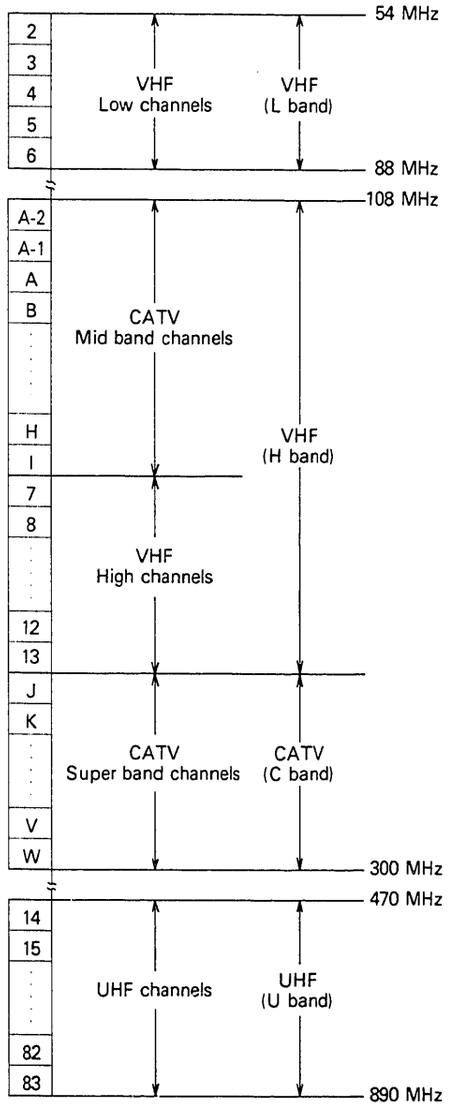
Band	Speeds
L	About 20 seconds
H	About 40 seconds
C	About 40 seconds
U	About 80 seconds

10. After releasing the TUNING button when the channel picture appears for the channel number you are programming, press the up (+) and down (–) TUNING buttons to fine tune the TV channel.
11. Repeat steps 7 through 10 for other channel.
12. Return the NORMAL/SELECT switch to "NORMAL".

13. To check programming, press the CHANNEL select buttons to cycle the VTR tuner through all the channels you have programmed. If a channel was missed or requires fine tuning, repeat above steps for the channel involved.

Always return the NORMAL/SELECT switch to "NORMAL" after preprogramming is complete.

Channel frequency spectrum



AFC (Automatic Frequency Control)

A channel is fine tuned using up (+) and down (—) TUNING buttons. When the NORMAL/SELECT switch is returned to "NORMAL", AFC is turned on and the channel "locks in". The AFC electronically optimizes the fine tuning adjustment.

If a TV channel signal is marginal due to graininess or ghosting, the picture may sometimes be improved by manually tuning for best picture and then defeating the AFC action. To turn AFC off, follow the procedure below.

AFC off tuning procedure

1. Make sure that NORMAL/SELECT switch is set to "NORMAL".
2. Select the desired channel on which to disable AFC by pressing CHANNEL select button.
3. Set the NORMAL/SELECT switch to "SELECT".
4. Press the AFC OFF button.
   "AFC" indication will disappear from the display.
5. Return the NORMAL/SELECT switch to "NORMAL".

Note:

1. The AFC is only switched off for the channel you have been programming. AFC remains in effect on all other channels. To defeat the AFC for additional channels, repeat the above steps.
2. Pressing the AFC OFF button once again will turn the AFC on.

Eliminating unwanted preset channels

You can rearrange the desired channels by eliminating unwanted preset channels for channel up/down selection.

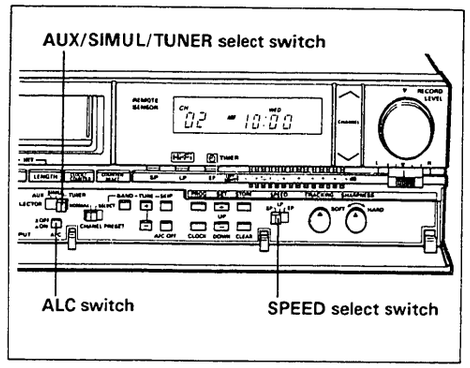
1. Press the CHANNEL select buttons until an unwanted channel is tuned.
2. Set the NORMAL/SELECT switch to "SELECT".
3. Press SKIP button once.
   Sound will go off indicating the channel has been erased from memory.
4. Repeat steps 1 through 3 until all unwanted channels have been eliminated.
5. Return the NORMAL/SELECT switch to "NORMAL".

Channels which have been eliminated cannot be selected by the CHANNEL select buttons.

Note: To restore the erased channel, repeat the above steps 1 through 3.

TIMER RECORDING

The programmable electronic clock/timer permits the unattended recording of up to 3 preselected programs, plus one program on the same day of each week. It can be preset up to 14 days in advance to record your favorite programs. It turns the unit on and off and changes channels automatically.



- Your TV does not have to be on to make a recording because the VTR records TV programmes without the aid of your TV. Its only use is for monitoring.

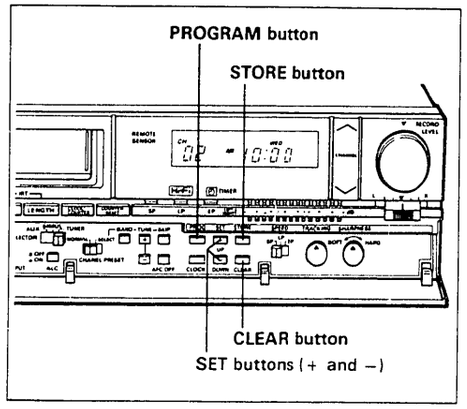
1. Turn power on.
2. Insert the Cassette.
3. Set the SPEED select switch to "SP", "LP" or "EP".
   Note: It is recommended to set to "SP" when recording a music program.
4. Set the AUX/SIMUL/TUNER select switch to "TUNER".
5. Set the program timer.
   "START (ON) TIME", "STOP (OFF) TIME", "DAY" etc. See below.
6. Turn power off. Now recording will begin automatically at the start time.

Note:

- It is not necessary to press PLAY and RECORD buttons.
- The TIMER indicator flashes to warn that recording will not occur because cassette has not been inserted. If the safety tab on the cassette has been removed, the VTR will automatically eject the cassette when placed in the Timer mode.

Programming the timer for unattended recording

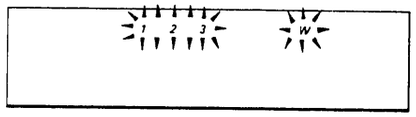
For unattended recording the timer needs to know what **day** to make the recording, the **time to start**, the **time to stop**, and the **channel to be recorded**.



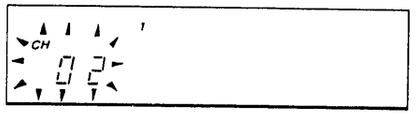
The timer is programmed using the PROGRAM, SET and STORE buttons. The PROGRAM button selects the timer programming mode. The SET buttons advance the Program indicators, Channel, Day, Hours or Minutes for recording. The STORE button stores them. The digits flash in sequence, so input the correct data to the flashing digits. When the STORE button is pressed, the flashing digits will be stored in memory.

If you input erroneous information by mistake when programming the timer, press the CLEAR button and input the correct information again.

1. Press the PROGRAM button.
   Program indicators (1 through 3 and W) flash to indicate which memory positions have not been programmed. If a memory has been programmed, its indicator will not flash.
   Note: You should determine which memory positions have not been programmed before entering new programming information. New information automatically erases previous programming.

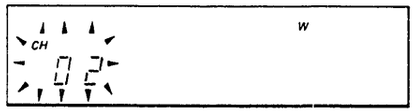


2. Press the SET button (+) repeatedly until the desired program indicator lights. Press the STORE button when the desired program number is displayed.

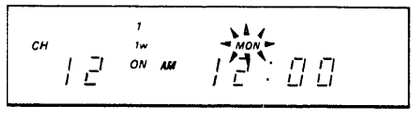


For example, diagram shows program "1" has been set.

To record on a specified day at the same time each week. Press the SET button (+) until the "W" indicator lights. Then press the STORE button.



3. Choose the channel to be recorded by pressing the SET (+ or −) or CHANNEL select button. Then press the STORE button.

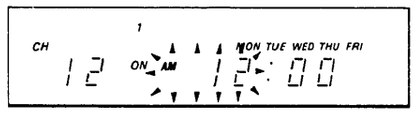


For example, diagram shows channel "12" has been set.

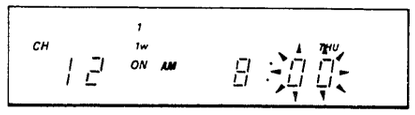
4. Press the SET button (+ or −) to select the day of recording. Make sure desired Week indicator (1W or 2W) lights. Continuing forward will advance timer to Week two.
Press the STORE button after selecting the day of recording.

For example, diagram shows recording on Thursday within 1 week from today.

To record at the same time on Monday through Friday:
Press the SET button (+ or −) until Monday through Friday indicators light, then press the STORE button.

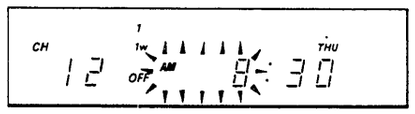


5. Select the hour for recording to start by pressing the SET (+ or −) button. Hold down button to advance rapidly. Press the STORE button after selecting the hour for recording to start.



For example, the diagram shows "AM 8" hours has been set.

6. Select the minutes for recording to start by pressing the SET button (+ or −). Hold down button to advance rapidly. Press the STORE button after selecting the minute for recording to start.



For example, the diagram shows "30" minutes has been set.

7. Select the hour and minute to stop recording in the same procedures described in steps 5 and 6. Be sure to press the STORE button after selecting the minute.

Now one programming has been completed. Display shows the start time when pressing the STORE button. After a few seconds the display shows stop time, the display returns to clock together with letters "PROG" automatically.
"PROG" shows that timer has been programmed; it lights whenever the timer-programming is done regardless of whether the power ON/OFF. To set the next programme, repeat steps 1 through 7.

Note: If a power failure occurs and the clock display shows "−−:−−", programming information previously set is cleared. The programming information should be reset.

To clear a program

1. Press the SET button (+) until desired program indicator lights. Then start time appears on the display.
2. Press the CLEAR button.
The display returns to clock to show that the programming has been cleared. Be sure to press the CLEAR button while the display shows the start or stop time. The programming does not clear if the CLEAR button is pressed when the display returns to clock.

To stop a timer recording while in progress

Press the POWER button and then press the STOP button within 10 seconds.
The program that was being recorded will be erased from the timer's memory.

To check programming

Press the SET button (+).
The program indicator "1" lights. If the program No. 1 has been already programmed, the "ON" indicator lights and the clock/timer display shows the starting time. Then the "OFF" indicator lights and the display automatically shows the time to stop recording in a few seconds with the channel number to be recorded lighting up. The display then automatically returns to the present time of day.

Programming errors

If programs overlap, the video deck will select the program with the earliest start time. When that program is over, the video deck will switch to the next program. If the start times are the same, the video deck will select the programs in numerical order.

CHAPTER 2

DISASSEMBLY

1. CASE REMOVAL

1. **Time door**
2. **Top cover**
3. **Bottom cover**
4. **Front panel**
5. **Rear cover**

1. Timer Door (Fig. 1)
1) Open the timer door.
2) Pull the timer door in the direction of the arrow to remove it.

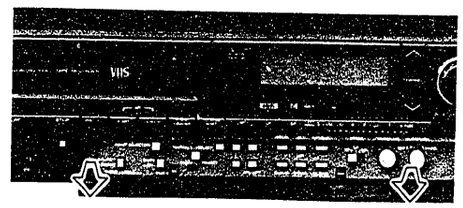


Fig. 1-1 Timer Door

2. Top Cover
1) Remove 3 top cover fixing screws.
2) Lift the rear of the top cover to remove it.

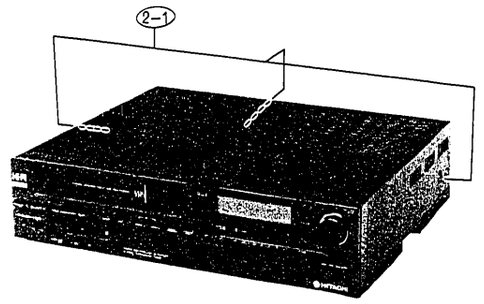


Fig. 1-2 Top Cover

3. Bottom Cover
1) Remove 7 bottom cover fixing screws.

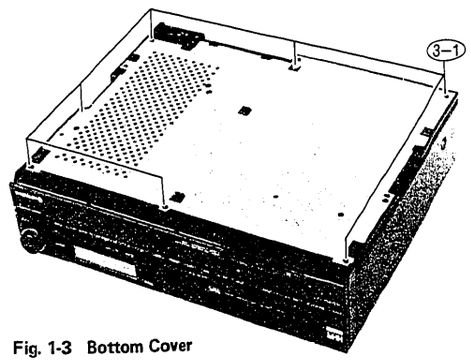


Fig. 1-3 Bottom Cover

4. Front Panel
1) Remove the top cover. (See Item 1-1)
2) Remove the bottom cover. (See Item 1-2)
3) Remove 3 front panel fixing screws.
4) Remove the recording level control knob.

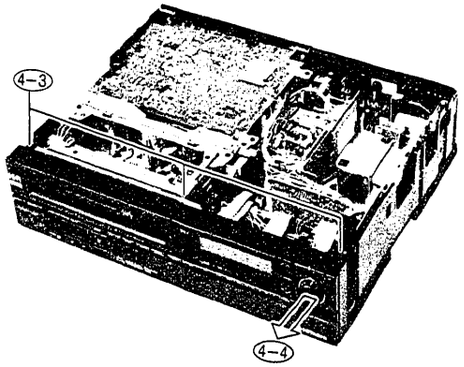


Fig. 1-4 Front Panel

5. Rear Cover
1) Remove the top cover. (See Item 1-1)
2) Remove 2 rear cover fixing screws.
3) Remove the pwoer cord clamp.

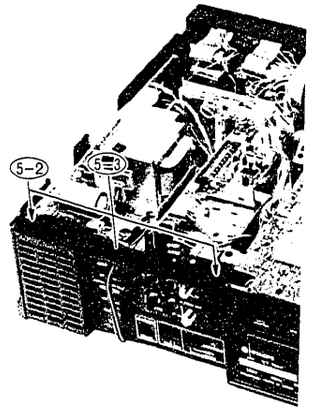


Fig. 1-5 Rear Cover

2. CIRCUIT BOARD AND ELECTRICAL COMPONENT LOCATIONS

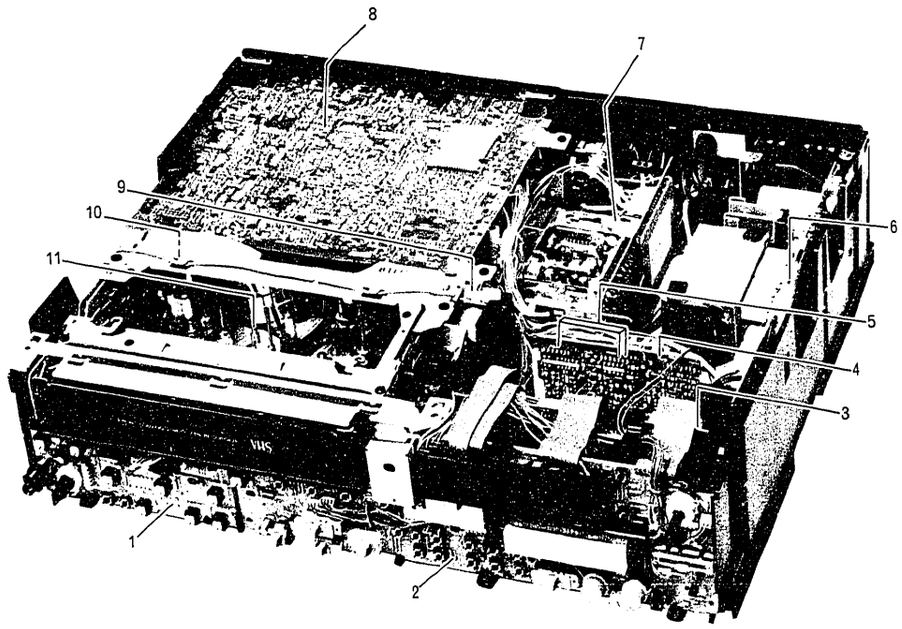


Fig. 2-1 Circuit Board, Electrical Component Locations (Top View)

1. Operation switch board
2. Timer board
3. V·S Tuning board
4. Audio mute board
5. Cylinder speed assist board
6. Regulator board
7. Tuner/IF pack board
8. FM audio board
9. Loading motor board
10. Supply end sensor board
11. End lamp board

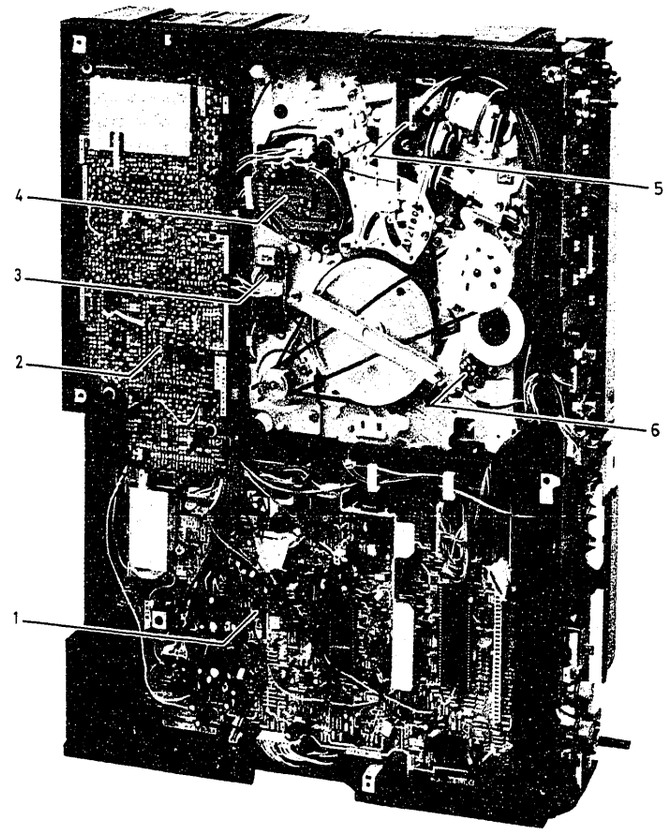


Fig. 2-2 Circuit Board, Electrical Component Locations (Bottom View)

1. Main board
2. Y/Chroma board
3. Capstan motor board
4. Cylinder motor board
5. Mechanism state switch
6. Reel sensor board

3. CIRCUIT BOARD REMOVAL

1. Operation switch board
2. Timer board
3. V.S Tuning board
4. Audio mute board
5. Cylinder speed assist board
6. FM audio board
7. Tuner/IF board
8. Regulator board
9. Y/Chroma board
10. Main board

1. Operation Switch Board [Fig. 3-1]

1) Remove the top cover. (See Item 1-1)
2) Remove the bottom cover. (See Item 1-2)
3) Remove the front panel. (See Item 1-3)
4) Push and widen 4 upper/lower stoppers to remove the board.

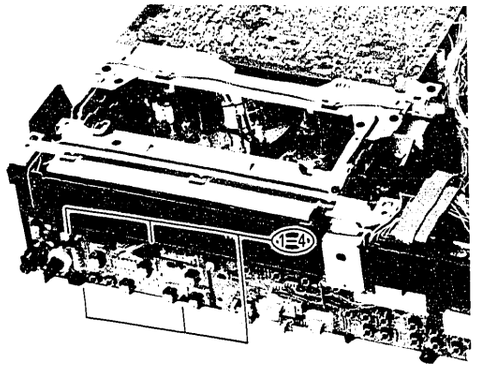


Fig. 3-1 Operation Switch Board

2. Timer Board [Fig. 3-2]

1) Remove the top cover. (See Item 1-1)
2) Remove the bottom cover. (See Item 1-2)
3) Remove the front panel. (See Item 1-3)
4) Bend up 4 flat cables.
5) Push and widen 6 upper/lower stoppers to remove the board.

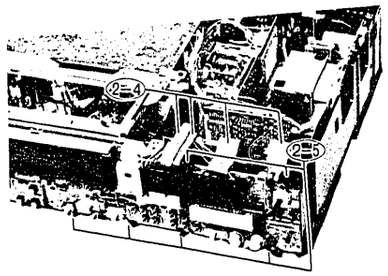


Fig. 3-2 Timer Board

3. V.S Tuning Board [Fig.3-3, 3-4]

1) Remove the top cover. (See Item 1-1)
2) Remove the bottom cover. (See Item 1-2)
3) Bend up 4 flat cables.
4) Release one stopper.
5) Disconnect one connector and pull out the connector pins inserted into the main board upward to remove it.

Note: Check that the connector pins are firmly inserted into the connector on the main board when re-assembling the board.

* Push in the connector pins while holding the connector from the components side of the main board so the connector pins can be inserted firmly.

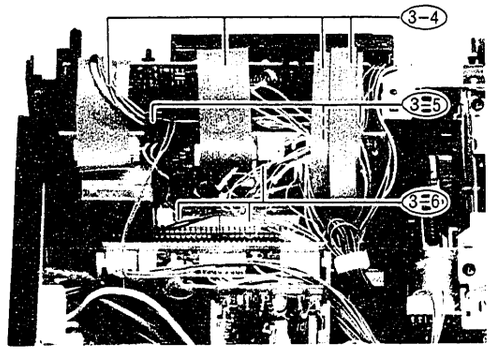


Fig. 3-3 V.S Tuning Board

* **Disconnecting/reconnecting the flat cable**

When disconnecting the flat cable for replacing the circuit board, pull out the cable while depressing the connector cover as shown in Fig. 3-4.

When reconnecting the flat cable, align the wires of the flat cable and depress the connector cover, then insert the cable.

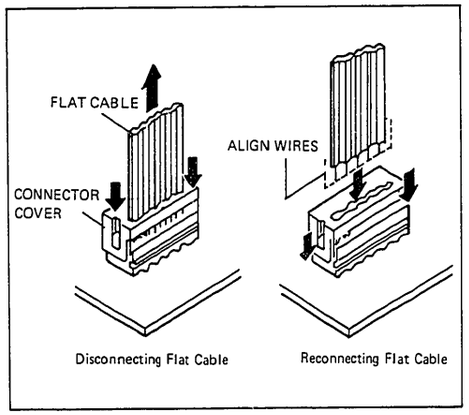


Fig. 3-4 Disconnecting/Reconnecting Flat Cable

4. Audio mute Board [Fig. 3-5]

1) Remove the top cover. (See Item 1-1)
2) Disconnect 2 connectors, push and widen the left/right stoppers and lift the board to remove it.

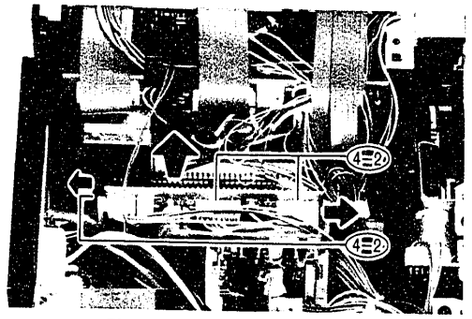


Fig. 3-5 Audio mute Board

5. Cylinder Speed Assist Board [Fig. 3-6]

1) Remove the top cover. (See Item 1-1)
2) Release the board clamp, and pull out the cylinder speed assist board upward.

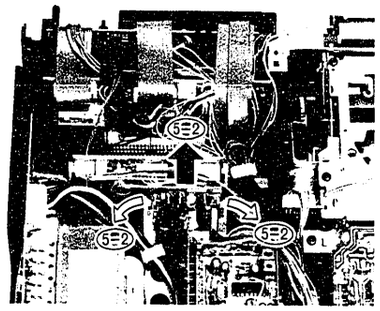


Fig. 3-6 Cylinder Speed Assist Board

6. FM Audio Board [Fig.3-7]

1) Remove the top cover. (See Item 1-1)
2) Remove 3 FM audio board fixing screws and release the jack clamp.
3) Push and widor the stopper to the board in the direction of arrow(A).

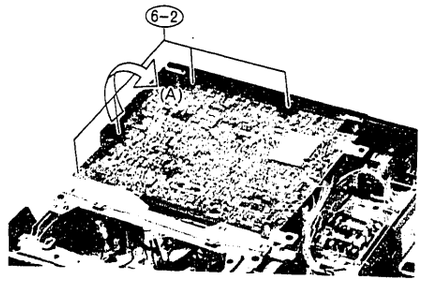


Fig. 3-7 FM Audio Board

7. Tuner/IF Board [Fig. 3-8]

1) Remove the top cover. (See Item 1-1)
2) Disconnect the connectors and RF cable.
3) Remove 3 screws and take out the tuner/IF board together with the tuner pack.

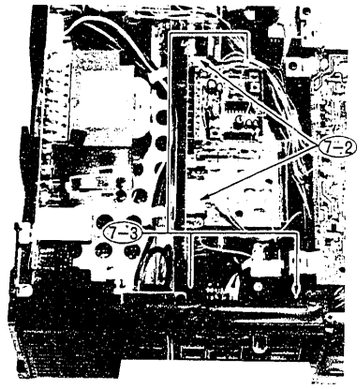


Fig. 3-8 Tuner/IF Board

8. Regulator Board [Fig. 3-9]

1) Remove the top cover. (See Item 1-1)
2) Remove the tuner/IF board and muting board.
3) Remove 4 screws and take out the regulator board together with the power supply assembly.

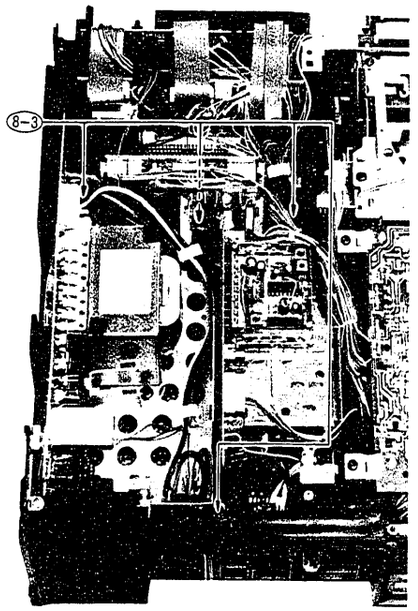


Fig. 3-9 Regulator Board

9. Y/Chroma Board [Fig. 3-10]

1) Remove the bottom cover. (See Item 1-2)
2) Remove 4 screws.
3) Disconnect 2 connectors and pull out the connector pins inserted into the main board upward to take out the board.

Note: Check that the connector pins are firmly inserted into the main board when reinstalling the board.

* Push in the connector pins while holding the connector of the main board so the connector pins can be inserted firmly.

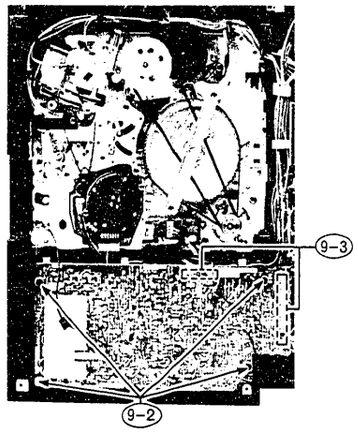


Fig. 3-10 Y/Chroma Board

10. Main Board [Fig. 3-11]

1) Remove the bottom cover. (See Item 1-2)
2) Remove 3 screws and release 4 stoppers.
3) Disconnect the connectors from the connector pins on the V.S tuning board and Y/chroma board.

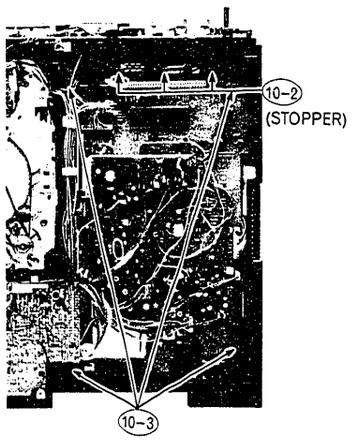


Fig. 3-11 Main Board

4. CASSETTE LOADING MECHANISM REMOVAL

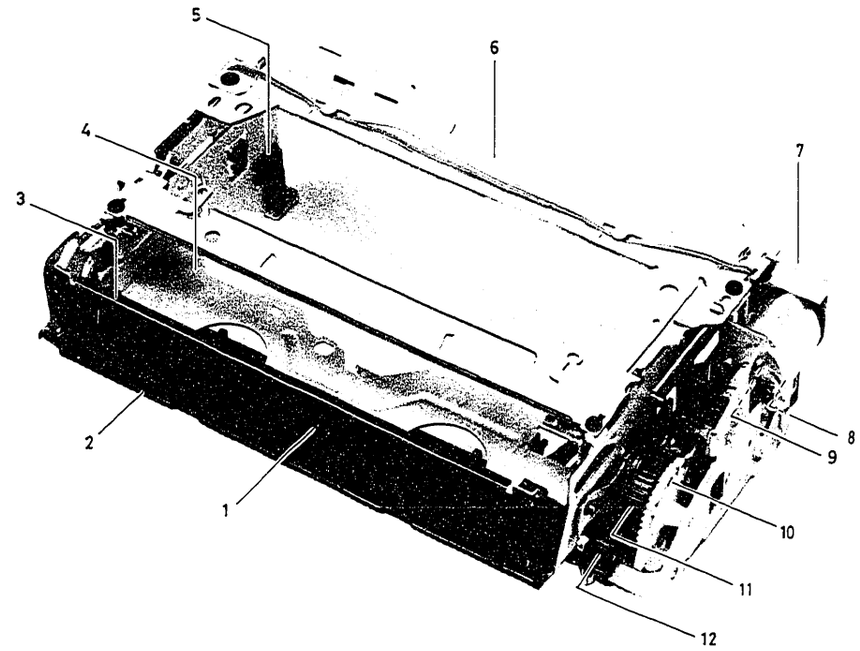


Fig. 4-1 Cassette Loading Mechanism

1. Cassette door
2. Front holder
3. Door arm
4. Cassette holder assembly
5. Supply end sensor board
6. Chassis holder
7. Cassette loading motor board
8. Cassette-in switch
9. Cassette-up switch
10. Drive gear
11. Clutch gear
12. Synchro gear

1. Cassette Loading Mechanism [Fig. 4-2]

1) Remove 3 shield cover fixing screws and take out the shield cover.
2) Slide the reinforcing plate in the direction of arrow (A), release the fitting with the frame and remove the reinforcing plate.
3) Disconnect connector CN4.
4) Remove 2 screws and lift the rear of the cassette loading mechanism, then remove the whole mechanism.

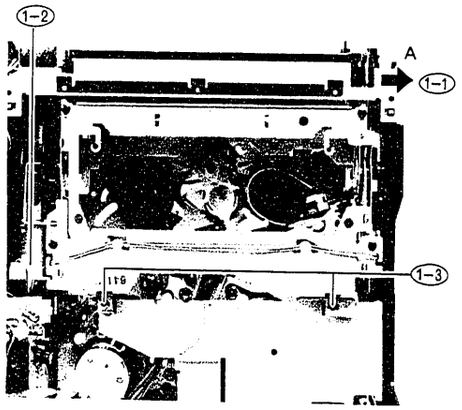


Fig. 4-2 Cassette Loading Mechanism

2. Chassis Holder [Fig. 4-3]

1) Remove 4 chassis holder fixing screws.

3. Cassette Door [Fig. 4-3]

1) Push the top right of the front holder to the right to release the fitting with the front holder.

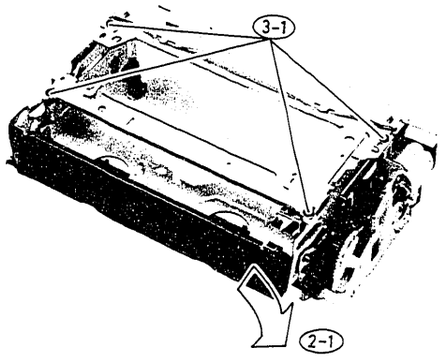


Fig. 4-3 Chassis Holder/Cassette Door

4. Supply End Sensor Board [Fig. 4-4]

1) Release one stopper.

* The supply end sensor board can be removed without removing the cassette loading mechanism. The take-up end sensor board is integrated with the cassette loading board, so refer to Item 4-8.

5. Door Arm [Fig. 4-4]

1) Remove the spring and release 2 fittings with the frame.

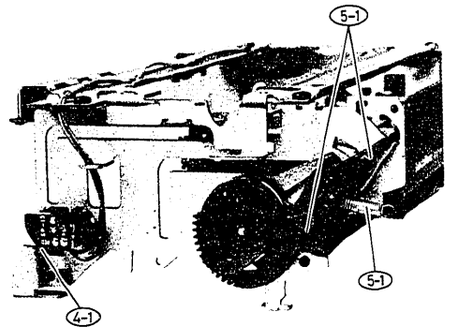


Fig. 4-4 Supply End Sensor Board/Door Arm

6. Front Holder [Fig. 20]

1) Remove the cassette loading motor block assembly. (See Item 4-7)
2) Remove the chassis holder and cassette door. (See Items 4-2, 4-3)
3) Remove 2 front holder fixing screws.

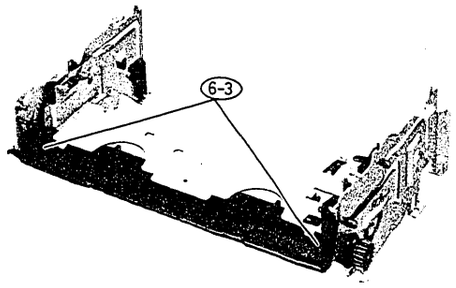


Fig. 4-5 Front Holder

Note: Check the following items when reinstalling the cassette loading mechanism.
(1) Check that thy left and right of the cassette holder are firmly inserted into the holder drive arms. (Figs. 4-6, 4-7)
(2) Check that markings (▷) on the synchro gears and clutch gears are aligned on the left and right. (Figs. 4-6, 4-7)

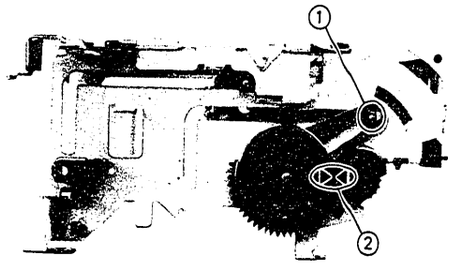


Fig. 4-6 Gear Marking (I)

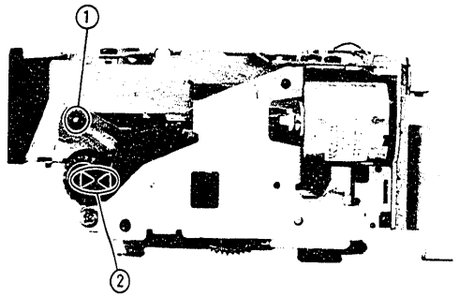


Fig. 4-7 Gear Marking (II)

7. Cassette Loading Motor Block Assembly [Fig. 4-8]

1) Remove 2 cassette loading motor block assembly.

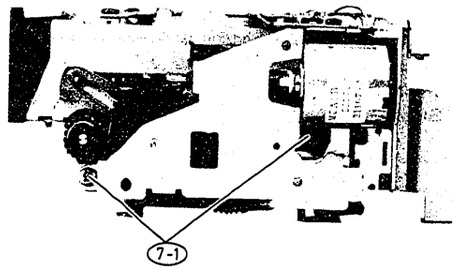


Fig. 4-8 Cassette Loading Motor Block Assembly

8. Cassette Loading Motor [Fig. 4-9]

1) Remove 2 cassette loading motor fixing screws.

9. Switch Lever [Fig. 4-9]

1) Remove 2 springs and pull out the switch lever in the direction of the arrow.

10. Clutch Gear [Fig. 4-9]

1) Pull out the clutch gear in the direction of the arrow.

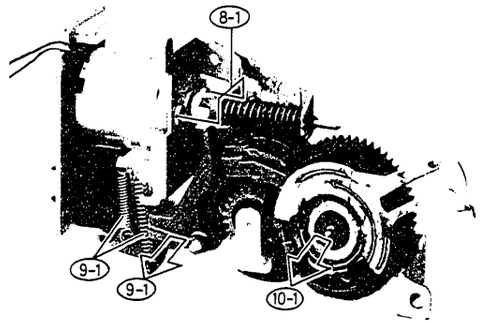


Fig. 4-9 Cassette Loading Motor/Switch Lever/Clutch Gear

Note: Check the following items when reinstalling the cassette loading motor block assembly.
(1) Check that the switch lever is firmly inserted into the groove in the clutch gear.
(2) Check that markings (mark ▷ and hole 0) on the clutch gear and drive gear are aligned.

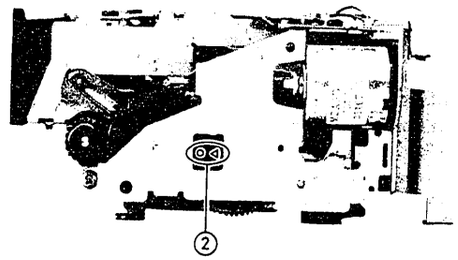


Fig. 4-10 Gear Marking (III)

5. MAIN MECHANICAL COMPONENT LOCATIONS

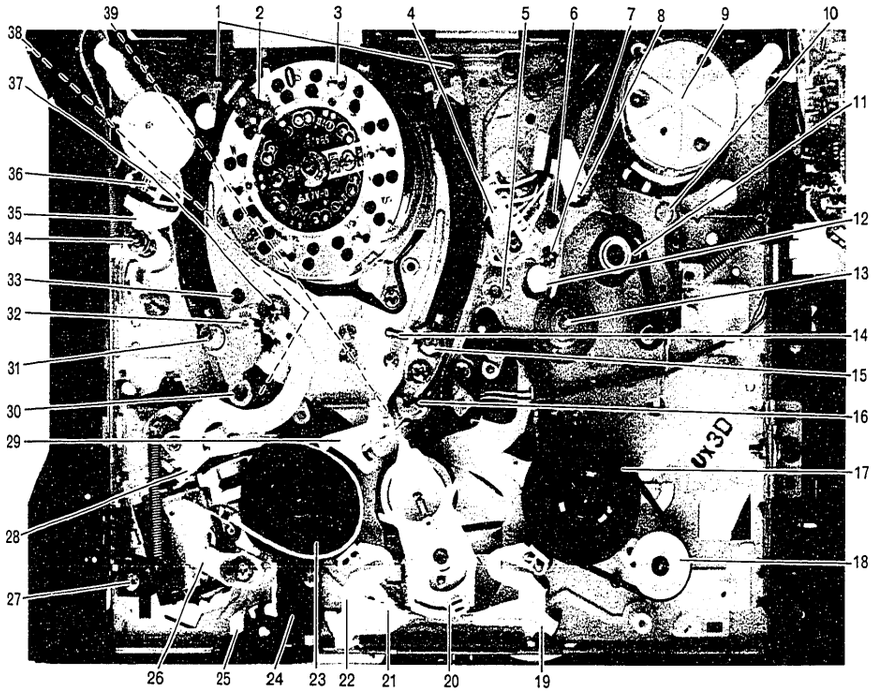


Fig. 5-1 Mechanism Top View

1. Catcher
2. Cylinder motor brush
3. Video head (upper cylinder)
4. AC head (audio/control head)
5. X value adjusting screw
6. Tilt adjusting screw
7. Azimuth adjusting screw
8. Height adjusting nut
9. Capstan motor assembly
10. Arm bracket assembly
11. Pressure roller assembly
12. Guide pole (tape guide)
13. Capstan shaft
14. Inclined guide (take-up)
15. Guide roller (take-up)
16. Guide roller base (take-up)
17. Take-up reel disk
18. Load pulley
19. Main brake (take-up)
20. Reel drive idler
21. Brake conversion arm
22. Main brake (supply)
23. Supply reel disk
24. Safety tab switch
25. Recording prevention arm
26. Tension band assembly (tension band/tension bracket)
27. Spring holder
28. Tension arm
29. Sub brake

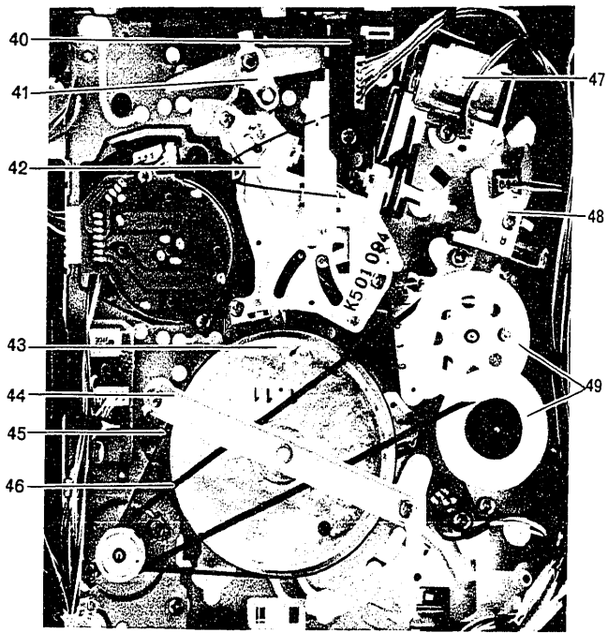


Fig. 5-2 Mechanism Bottom View

30. Guide roller base (supply)
31. Gude roller (supply)
32 Inclined guide (supply)
33. Guide base support plate
34. Guide pole (supply)
35. Impedance roller arm assembly
36. FE (full erase) head
37. Tension pole
38. Supply loading link
39. Take-up loading link
40. Mechanism state switch
41. Tension release arm 2
42. Loading gear assembly
43. Flywheel assembly
44. Flywheel support plate
45. Flywheel belt
46. Reel belt
47. Loading motor assembly
48. Brake slider assembly
49. Clutch plate assembly

6. MAIN MECHANICAL COMPONENT REMOVAL

Reinstall the components by the reverse procedure to removal where no cautions (marked *) are given.

Head
1. Cylinder motor assembly
2. FE (full erase) head
3. A/C (audio/control) head

Motor
4. Cylinder motor
5. Capstan motor
6. Loading motor

Sensor/switch
7. Take-up reel sensor
8. Mechanism state switch
9. End lamp
10. Safety tab

Other items
11. Pressure roller
12. Impedance roller
13. Main brake
14. Supply sub-brake
15. Load pulley
16. Reel drive idler
17. Tension band/tension arm
18. Supply reel disk
19. Take-up reel disk
20. Supply guide pole
21. Take-up guide pole
22. Guide roller
23. Brake slider
24. Loading link
25. Loading gear

1. Cylinder Motor Assembly (Figs. 5-3, 5-4)
1) Remove the brush fixing screw and take out the cylinder motor brush.
2) Remove the connector cover fixing screw and take out the connector cover.
3) Disconnect 2 connectors from the video head board.
4) Disconnect one connector from the cylinder motor Board and 2 connectors from the cylinder FG board.
5) Remove 3 cylinder motor assembly fixing screws and pull out the assembly upward.
6) Divide the cylinder motor assembly and cylinder motor while referring to "Cylinder motor".

* Be sure not tot touch the video and FM Audio head tips with a finger or tool during work.
* Wrap the motor in a soft cloth if the same motor is to be reinstalled. Clean the motor tape guide surface and upper cylinder after the motor is installed.
* Perform adjustment referring to "Adjustments after replacing the cylinder (video and FM Audio heads)" after reinstalling the upper cylinder.

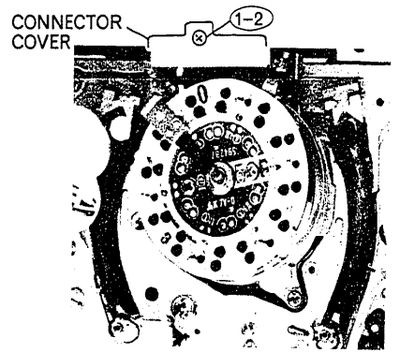


Fig. 5—3 Cylinder Motor Assembly

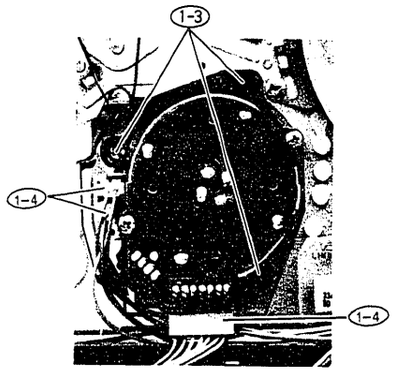


Fig. 5—4 Cyinder Motor Assembly

2. FE Head (Figs. 5-5, 5-6)
1) Remove the spring between the FE head base and chassis.
2) Remove the guide pole fixing nut, and pull out the guide pole, spring and washer.
3) Pull out the FE head base and remove the FE head fixing screw at the back of the base.

* After replacing or reinstalling the FE head, clean the each tape contact surface of the FE head and the guide pole.
* Adjust the height of the guide pole after reinstalling it.

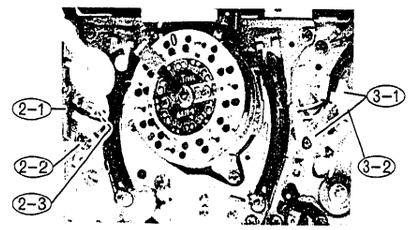


Fig. 5—5 FE Head

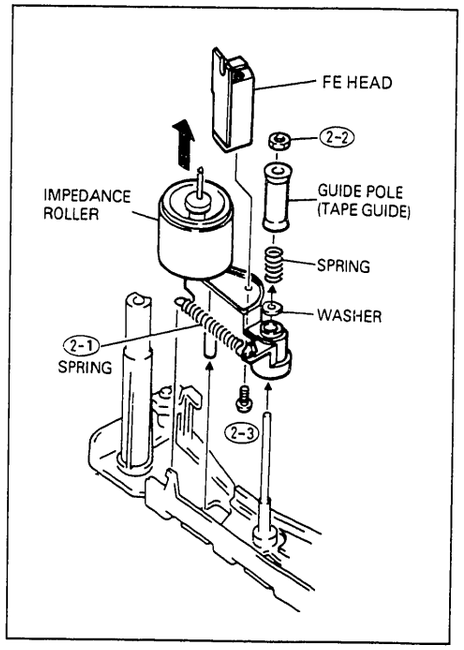


Fig. 5—6 FE Head

3. A/C Head (Fig. 5-5, Fig. 5-7)
1) Release the cord from the wiring guide, and pull out the connector.
2) Remove the head base fixing nut and washer.

* When reinstalling hook the bottom of the spring under the head base to the chassis and the top of the spring, to the stopper on the base.
* After replacing or reinstalling the A/C head, clean the tape contact surface of the head.
* Adjust the A/C head after reinstalling it.

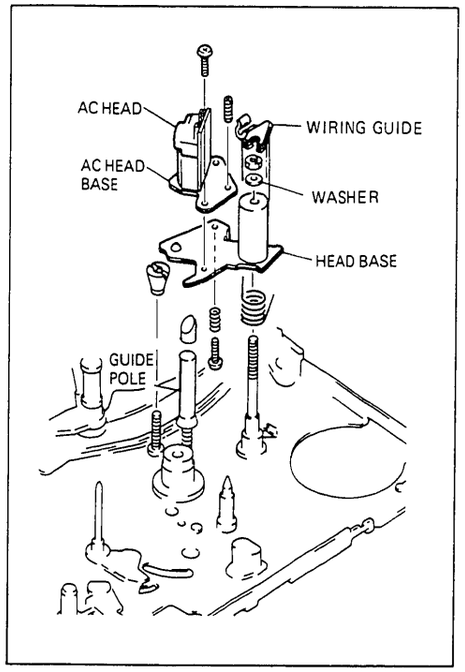


Fig. 5-7 A/C Head

4. Cylinder Motor Assembly (Figs. 5-8, 5-9, 5-10)
1) Remove 2 screws.
2) Turn the cylinder motor board clockwise to lift it.

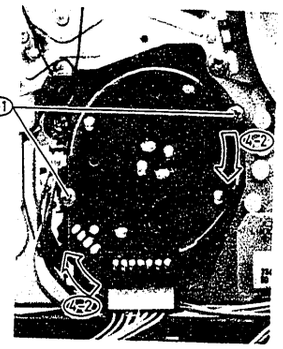


Fig. 5-8 Cylinder Motor

3) Remove 2 screws from the rotor and lift the rotor magnet.

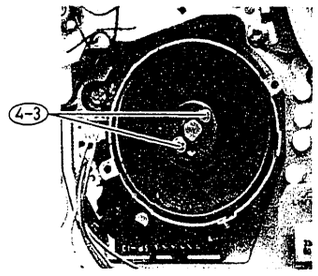


Fig. 5-9 Rotor Magnet

4) Remove internal screws and take out the cylinder FG board.

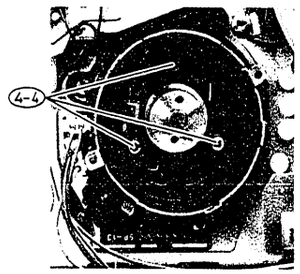


Fig. 5-10 Cylinder FG

5. Capstan Motor (Figs. 5-11)
   1) Remove the reel belt
   2) Remove the flywheel belt.
   3) Remove 2 capstan motor holder fixing screws, and lift the holder to remove it.

   * Adjust the capstan speed after reinstalling the capstan motor.

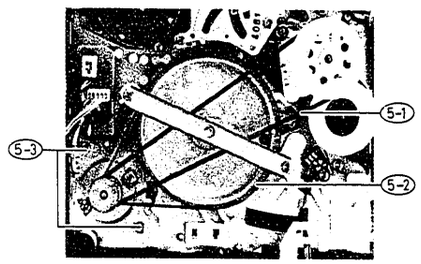


Fig. 5-11 Capstan Motor

6. Loading Motor (Fig. 5-12)
   1) Remove the loading belt.
   2) Disconnect connector CN3 and remove the bracket fixing screw to remove the loading motor.

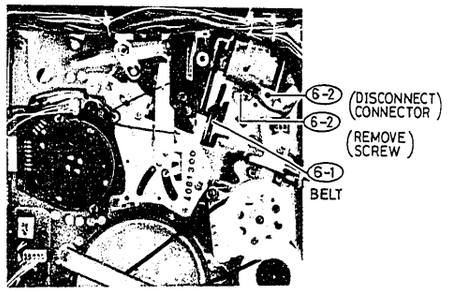


Fig. 5-12 Loading Motor

7. Reel Sensor (Fig. 5-13)
   1) Remove the reel sensor fixing screw.

8. Mechanism State Switch (Fig. 5-13)
   1) Remove the spring from the switch slider.
   2) Remove the mechanism state switch fixing screw, hold the switch by the screw hole and lift it to release the fitting with the chassis.

   * When reinstalling, fit the switch lever into the groove in the slider and fix it with the screw.
   * Adjust the mechanism state switch after reinstalling it.

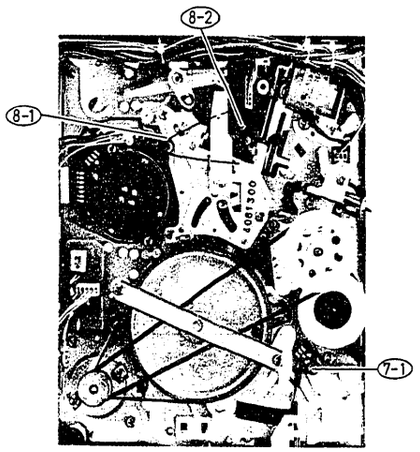


Fig. 5-13 Reel Sensor, Mechanism State Switch

9. End Lamp (Fig. 5-14)
   1) Remove one screw to take out the end lamp board.

10. Main Brake (Fig. 5-14)
   1) Remove the cassette loading mechanism. (See Item 4-1)
   2) Remove the spring between the supply and take-up brakes.
   3) Release the fitting with the chassis.

11. Sub Brake (Fig. 5-14)
   1) Remove the cassette loading mechanism. (See Item 4-1)
   2) Remove the spring between the sub chassis and brake.
   3) Release the fitting of the brake rotating shaft.

12. Tension Band/Tension Arm (Fig. 5-14)
   1) Remove the cassette loading mechanism. (See Item 4-1)
   2) Remove the spring between the tension arm and spring holder.
   3) Remove the tension band fixing screw.
   4) Release the fitting of the tension arm and pull out the tension band and tension arm.

   * Adjust the tension pole position and tension after reinstalling the tension band and tension arm.

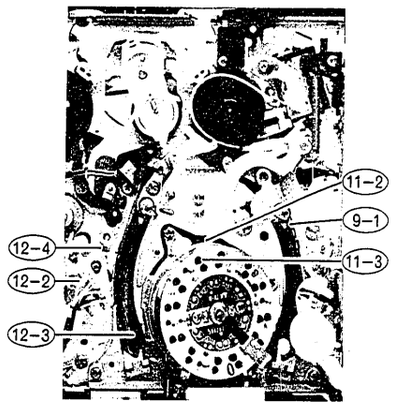


Fig. 5-14 End Lamp/Main Brake/Sub Brake/Tension Band/Tension Arm

13. Supply Reel Disk (Fig. 5-15)
   1) Remove the cassette loading mechanism. (See Item 4-1).
   2) Remove the tension band and tension arm.
   3) Remove the supply sub brake.
   4) Remove the washer at the top of the disk.

   * The collar and washer are inserted between the disk and chassis; reinstall the disk after checking them.

14. Take-up Reel Disk (Fig. 5-15)
   1) Remove the cassette loading mechanism.(See Item 4-1)
   2) Remove the rubber belt between the load pulley and reel disk.
   3) Remove the washer at the top of the disk.

   * The washer is inserted between the disk and chassis; reinstall the disk after checking it.

15. Load Pulley (Fig. 5-15)
   1) Remove the cassette loading mechanism.(See Item 4-1)
   2) Remove the rubber belt between the pulley and reel disk.
   3) Remove the washer holding the pulley.

16. FF/REW Idler (Fig. 5-15)
   1) Remove the cassette loading mechanism.(See Item 4-1)
   2) Move the spring holder in the direction of the arrow and remove the FF/REW idler.

17. Safety Tab Switch (Fig. 5-15)
   1) Disconnect connector CN5.
   2) Remove one screw to take out the safety tab switch.

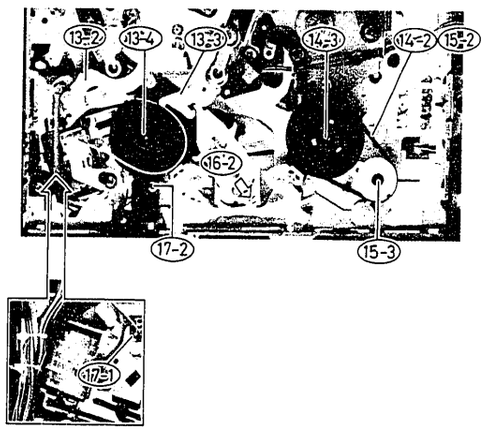


Fig. 5-15 Supply/Take-up Reel Disks, Load Pulley, FF/REW Idler, Safety Tab Switch

18. Pressure Roller Arm Assembly (Fig. 5-16)
1) Remove the shield cover. (See Item 4-1)
2) Remove the washer.
3) Remove the pressure roller arm assembly.

19. Arm Bracket Assembly (Fig. 5-16)
1) Remove the cassette loading mechanism.
2) Remove the take-up reel.
3) Remove the washer and then remove the pressure roller assembly.
4) Release 2 wires from the chassis.
5) Remove 2 screws to take out the arm bracket assembly.

* Reinstall the arm bracket assembly by the reverse procedure to disassembly while taking care of the following and the coupling sections shown in Fig. 5-16.
(1) Check that the operation arm shaft is inserted into the hole in the T brake operation arm.
(2) Check that the drive arm shaft is inserted into the hole in the coupling piece.

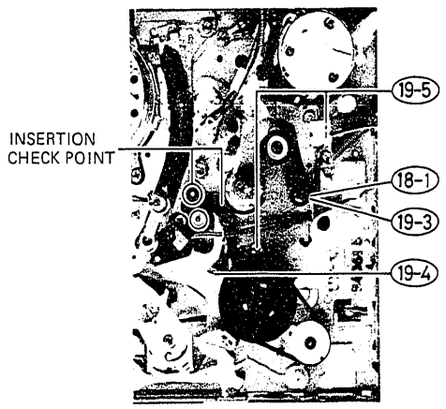


Fig. 5-16 Pressure Roller Assembly, Arm Bracket Assembly

20. Capstan Flywheel (Fig. 5-17, Fig. 5-18)
1) Remove 2 screws holding the flywheel support plate to remove it.
2) Pull out the nylon washer on the top. (Fig. 5-18)
3) Remove the reel belt and flywheel belt, and then pull out the flywheel upward.

* Reinstall the capstan flywheel by the reverse procedure to disassembly, and remove oil sticking to the surface of the capstan using Freon.

21. Clutch Plate Assembly (Fig. 5-17)
1) Remove the FF/REW idler. (See Item 6-16)
2) Remove the reel belt. (20-3)
3) Remove 2 clutch plate assembly fixing screws.
4) Lift the clutch plate assembly to remove it while pressing the main brake arm and brake conversion arm in the direction of the arrow.

22. Brake Slider (Fig. 5-17)
1) Remove the FF/REW idler. (See Item 6-16)
2) Remove the clutch plate assembly.
3) Remove one screw holding the brake slider to take it out.

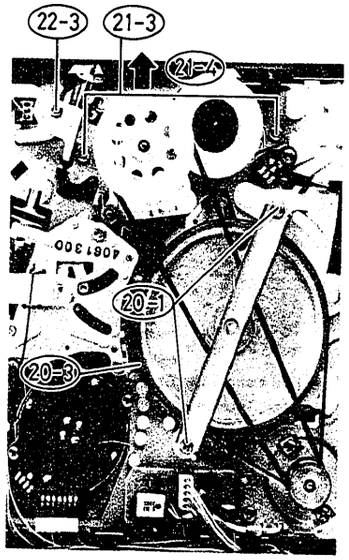


Fig. 5-17 Capstan Flywheel/Clutch Plate Assembly/Brake Slider

23. Loading Link (Fig. 5-18)
1) Remove the cassette loading mechanism. (See Item 4-1)
2) Remove the tension band, tension arm and supply brake. (See Item 6-12)
3) Remove 3 guide base support plate fixing screws, and then remove the sub chassis, guide roller and inclined guide together with the base.

* When reinstalling the loading link, align the tab of the the loading gear and the groove in the loading link.
* When reinstalling the guide base, insert the pin at the back of the guide base into the hole in the loading link.

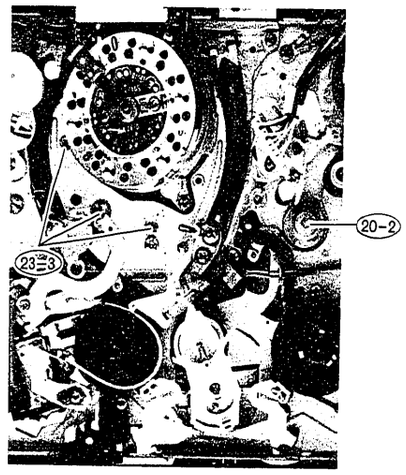


Fig. 5-18 Loading Link

24. Loading Gear (Figs. 5-19, 5-20)
1) Remove the cassette loading mechanism. (See Item 4-1)
2) Remove 2 loading link fixing screws.
3) Remove the capstan flywheel. (See Item 6-20)
4) Remove the clutch plate assembly. (See Item 21.)
5) Remove the brake slider. (See Item 22.)
6) Remove the mechanism state switch. (See Item 8.)
7) Remove the spring from the loading gear assembly.
8) Remove the mode slider.
9) Remove the tension release arm.
10) Remove the loading belt.
11) Remove 3 screws holding the loading gear assembly to take it out.

* When reinstalling, insert the pin on the drive arm of the take-up sub brake into the hole in its operation arm and the pin on the drive arm of the pressure roller into the hole in its operation arm.

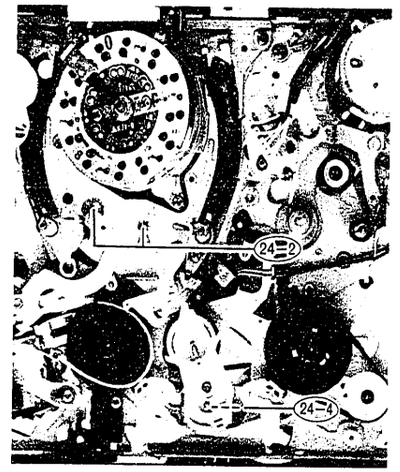


Fig. 5-19 Loading Link

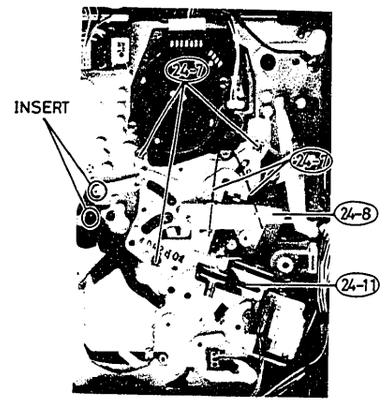


Fig. 5-20 Loading Gear

CHAPTER 3
ADJUSTMENT

SERVICING JIGS AND TOOLS

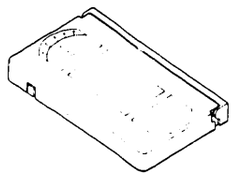
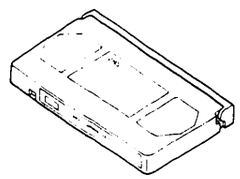
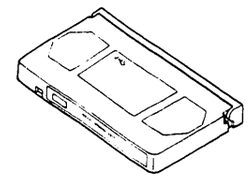
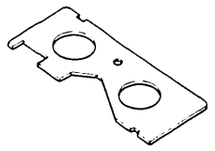
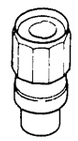
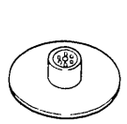
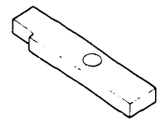
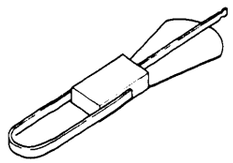
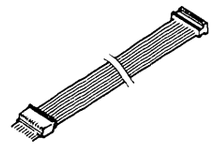
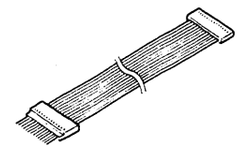
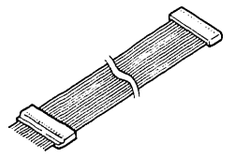
1 Back-tension meter Jig. No. 7099004 	2 Alignment tape Jig. No. 7099046 	3 Hi/Fi Alignment tape Jig. No. 7099153 
4 Master plane Jig. No. 7099041 	5 Torque gauge Jig. No. 7099039 	6 Torque gauge adaptor Jig. No. 7099035
7 Dummy reel Jig. No. 7099043 	8 Reel disk height jig Jig. No. 7099038 	9 1.5 mm hexagonal wrench —
10 Fan-type tension gauge — 	11 Relay connector (11P) Jig. No. 7099184 	12 Relay connector (15P) Jig. No. 7099185 
13 Relay connector (18P) Jig. No. 7099186 		

Fig. 1 Adjustment Jigs

Main Board Servicing Method I

Remove the tuner/IF pack board, cylinder speed assist board and the regulator board together with the power frame, and service the main board in the state shown in Fig. 2.

* When there is any position on the board which cannot be checked in this method, remove the main board according to servicing method II and use the relay connector to check.

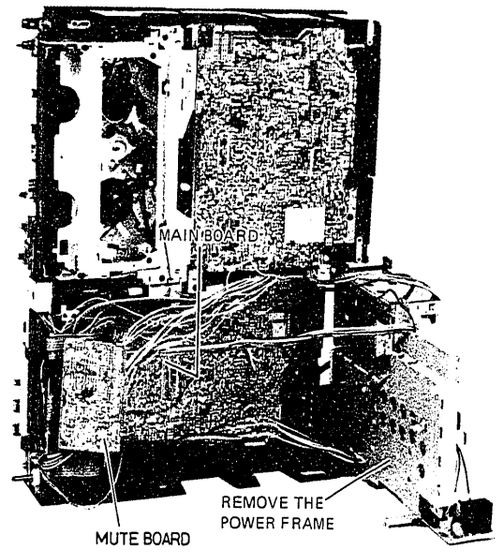


Fig. 2 Main Board Servicing Method I

Main Board Servicing Method II

Use 4 relay connectors shown below and check that the connectors are firmly connected between the boards as shown in Fig. 3 before starting servicing.

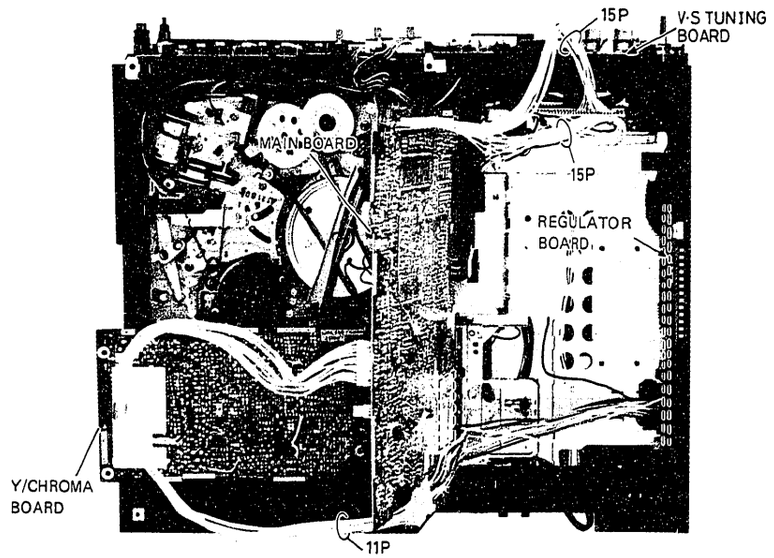
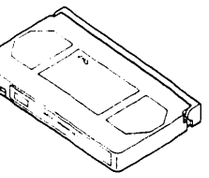


Fig. 3 Main Board Servicing Method II

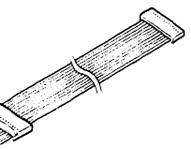
Fi Alignment tape
g. No. 7099153



que gauge adaptor
g. No. 7099035

nm hexagonal wrench
—

y connector (15P)
. No. 7099185



Main Board Servicing Method I

Remove the tuner/IF pack board, cylinder speed assist board and the regulator board together with the power frame, and service the main board in the state shown in Fig. 2.

* When there is any position on the board which cannot be checked in this method, remove the main board according to servicing method II and use the relay connector to check.

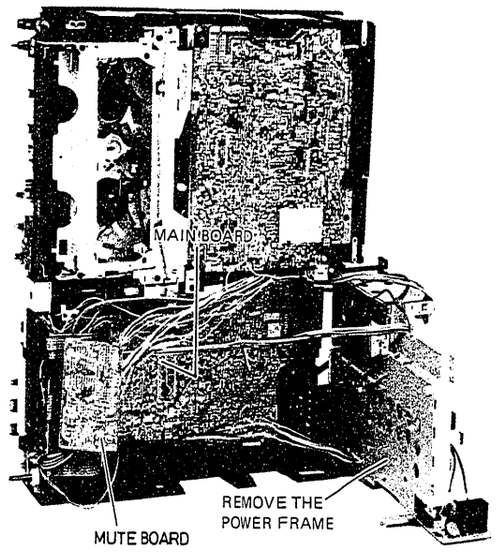


Fig. 2 Main Board Servicing Method I

Main Board Servicing Method II

Use 4 relay connectors shown below and check that the connectors are firmly connected between the boards as shown in Fig. 3 before starting servicing.

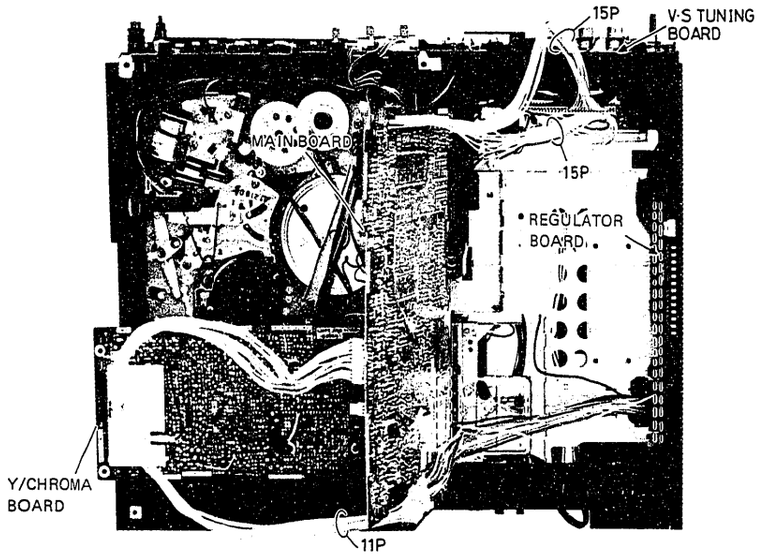


Fig. 3 Main Board Servicing Method II

ELECTRICAL CIRCUIT ADJUSTMENT

Test equipment, jigs and tapes required for integrated adjustments of the circuits.

1) Monitor color TV
2) Oscilloscope
3) VTVM
4) Color bar signal generator
5) Frequency counter
6) DC voltmeter
7) Alignment tape
8) Blank tape

Perform adjustments according to the following procedure.

Cylinder speed assist circuit
↓
Servo circuit
↓
Linear audio circuit
↓
FM audio circuit
↓
Y/Chroma circuit

1. CYLINDER SPEED ASIST CIRCUIT ADJUSTMENT

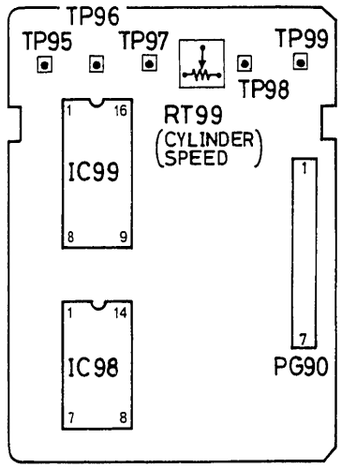


Fig. 1-1 Cylinder Speed Assist Board (Parts Side)

1. Cylinder Speed Adjustment: RT99

This adjustment reduces horizontal jitter on the monitor screen in play mode.

1) Apply an color bar signal to the video input jack on the rear panel or tune to a TV program.
2) Short-circuit TP97 and TP95 using a jumper.
3) Connect channel-1 of the oscilloscope to test point terminal TP98.
4) Connect channel-2 of the oscilloscope to test point terminal TP96.
5) Set the AC/GND/DC select switch of the oscilloscope to "GND" and align the ground lines of channels 1 and 2.
6) Load a blank tape and set the VTR to the SP record mode.
7) Set the AC/GND/DC select switch of the oscilloscope to "DC" and adjust the Cylinder Speed Control (RT99) to equalize the voltages of channels 1 and 2.

Note: Set the probe to 10:1 for use.

SERVO/AUDIO (MAIN) P.C. BOARD

Remove the bottom cover, place the VTR with the left down and perform the adjustment by the following procedure.

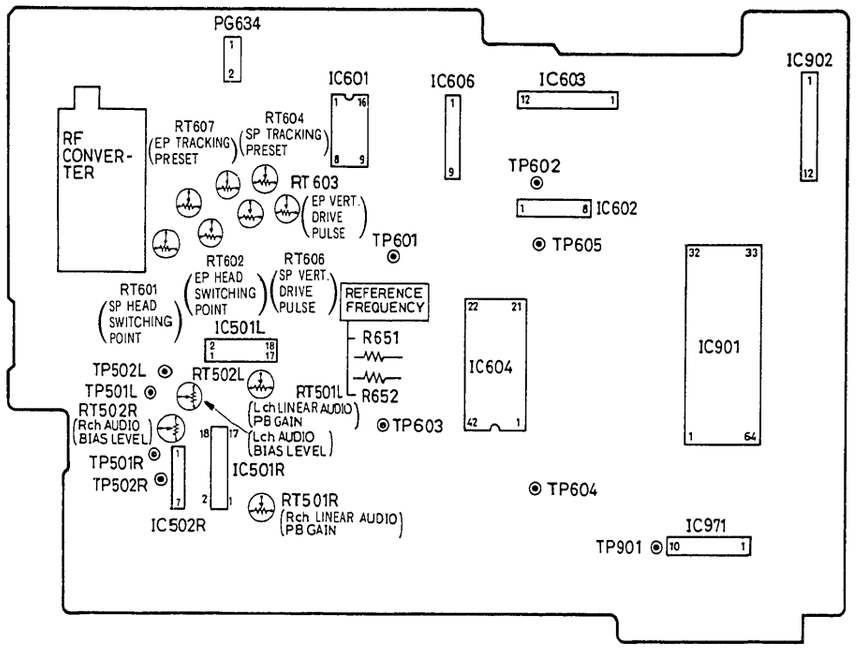


Fig. 2-1 Main Board (Parts Side)

2. SERVO CIRCUIT ADJUSTMENT

1. Reference Oscillation Frequency Adjustment (R651, R652)

This adjustment fine tunes the reference oscillation frequency (REF30) in the phase control system to correct the rotation transmission loss caused by unevenness within tolerances in the diameters of the flywheel and pulley, etc. If this adjustment is incomplete, noise appears in the picture of tracking cannot be optimized.

Connecting test equipment

1) Connect the frequency counter to the audio output jack on the rear panel.

State of VTR

2) Short-circuit test point terminals TP601 and TP603, and set only the servo phase control system (IC604) to the record mode.
   Set the recording speed select switch to "EP".
3) Play back the audio 3 kHz signal on the alignment test tape

Adjust procedure

4) Check that the reading of the frequency counter is 3000 Hz ±15 Hz. Omit R651 when it is more than 3015 Hz, and omit R652 when it is less than 2985Hz.

Note: There are some units in which R651 or R652 has been omitted.

2. Head Switching Point Adjustment

SP Head Switching Point: RT601
EP Head Switching Point: RT602

This adjustment determines the switching point of the video heads during play. If this adjustment is incomplete, the FM signal is degraded and switching noise or H/V jitter appears in the picture.

Connecting test equipment

1) Connect channel-2 of the oscilloscope to the video output jack on the rear panel.
2) Connect channel-1 of the oscilloscope to TP604 (SW30 Hz) on the main board, and trigger channel-1.

State of VTR

3) Play back the alignement tape

SP Head Switching Point: RT601

Adjustment procedure

4) Set the sync slope select switch of the oscilloscope to "–".
5) Adjust RT601 so that the vertical sync signal is Placed 6.5H ± 0.5H from the fall of the SW30 Hz signal.

EP Head Switching Point: RT602

Adjustment procedure

6) Short-circuit test mode plug PG499 (on the FM Audio board) to activate the test mode. The VTR operates in the SP mode and only the video heads are switched from SP to EP.
7) Adjust RT602 by the same procedure as in 4) and 5) above.

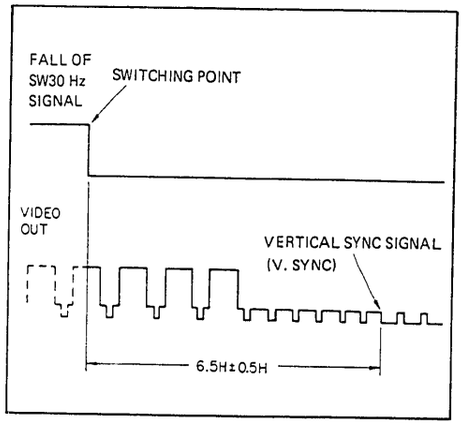


Fig. 2-2 Head Switching Point

3. Tracking Preset Adjustment: RT604

SP Tracking Preset: RT604
EP Tracking Preset: RT607

This adjustment optimizes tracking when playing back a tape recorded by the same unit. If this adjustment is incomplete, noise is conspicuous in the played back picture when the tracking control is in the center click position, or noise may not be removed from the played back picture completely when the tracking control is turned.

Connecting test equipment

1) Connect the color bar generator to the video input jack on the rear panel and feed a color bar signal or tune to a TV program.
2) Connect channel-1 of the oscilloscope to the test point terminal TP605, and trigger channel-1.
3) Connect channel-2 of the oscilloscope to the video output jack on the rear panel.
4) Set the tracking control (RV751) to the center click position.

SP Tracking Preset: RT604

State of VTR

5) Load a blank tape and record in the SP mode, then rewind the tape and play back the recorded section with the same unit.

Adjustment procedure

6) Adjust RT604 to match the phases of the control pulse and the V sync signal.

EP Tracking Preset: RT607

VTR condition

7) Load a blank tape and record in the EP mode, then rewind and play it back with the same VTR.

Adjustment Procedure

8) Adjust RT607 to match the phases of the CTL pulse and V. sync signal.

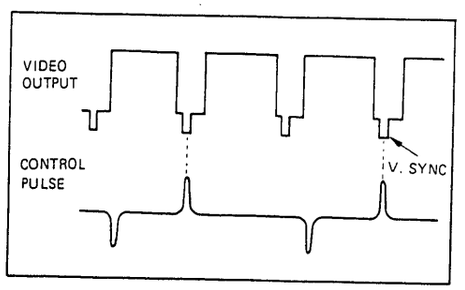
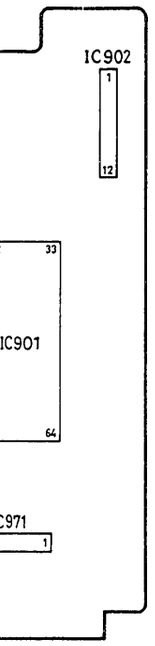


Fig. 2-3 Tracking Preset

following



f the frequency counter is
R651 when it is more than
when it is less than 2985Hz.

in which R651 or R652 has

2. Head Switching Point Adjustment

SP Head Switching Point: RT601
EP Head Switching Point: RT602

This adjustment determines the switching point of the video heads during play. If this adjustment is incomplete, the FM signal is degraded and switching noise or H/V jitter appears in the picture.

Connecting test equipment

1) Connect channel-2 of the oscilloscope to the video output jack on the rear panel.
2) Connect channel-1 of the oscilloscope to TP604 (SW30 Hz) on the main board, and trigger channel-1.

State of VTR

3) Play back the alignement tape

SP Head Switching Point: RT601

Adjustment procedure

4) Set the sync slope select switch of the oscilloscope to "–".
5) Adjust RT601 so that the vertical sync signal is Placed 6.5H ± 0.5H from the fall of the SW30 Hz signal.

EP Head Switching Point: RT602

Adjustment procedure

6) Short-circuit test mode plug PG499 (on the FM Audio board) to activate the test mode. The VTR operates in the SP mode and only the video heads are switched from SP to EP.
7) Adjust RT602 by the same procedure as in 4) and 5) above.

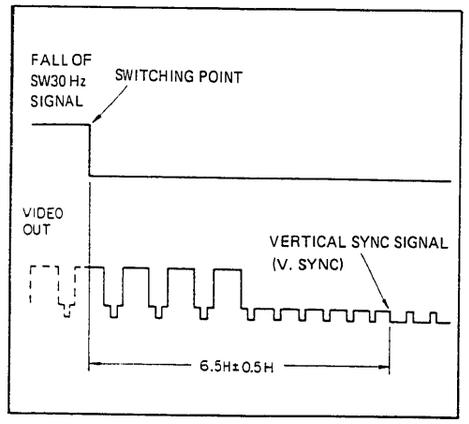


Fig. 2-2 Head Switching Point

3. Tracking Preset Adjustment: RT604

SP Tracking Preset: RT604
EP Tracking Preset: RT607

This adjustment optimizes tracking when playing back a tape recorded by the same unit. If this adjustment is incomplete, noise is conspicuous in the played back picture when the tracking control is in the center click position, or noise may not be removed from the played back picture completely when the tracking control is turned.

Connecting test equipment

1) Connect the color bar generator to the video input jack on the rear panel and feed a color bar signal or tune to a TV program.
2) Connect channel-1 of the oscilloscope to the test point terminal TP605, and trigger channel-1.
3) Connect channel-2 of the oscilloscope to the video output jack on the rear panel.
4) Set the tracking control (RV751) to the center click position.

SP Tracking Preset: RT604

State of VTR

5) Load a blank tape and record in the SP mode, then rewind the tape and play back the recorded section with the same unit.

Adjustment procedure

6) Adjust RT604 to match the phases of the control pulse and the V sync signal.

EP Tracking Preset: RT607

VTR condition

7) Load a blank tape and record in the EP mode, then rewind and play it back with the same VTR.

Adjustment Procedure

8) Adjust RT607 to match the phases of the CTL pulse and V. sync signal.

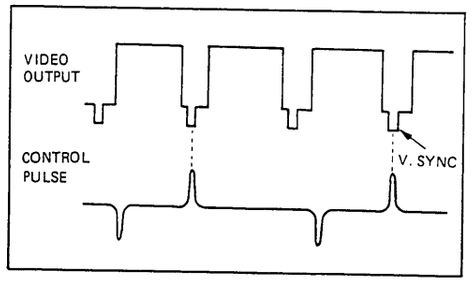


Fig. 2-3 Tracking Preset

4. Vertical Drive Pulse Adjustments

SP Vert Drive Pulse: RT606
EP Vert Drive Pulse: RT603

This adjustment removes vertical jitter in the TV picture in the still play mode.

Connecting test equipment

1) Connect the color bar generator to the video input jack on the rear panel and feed a color bar signal or tune to a TV program.
2) Connect the VHF output terminal on the rear panel and the VHF input terminal of the monitor TV.

SP Vert Drive Pulse: RT606

State of VTR

3) Load a blank tape and record in the SP mode, then rewind the tape and play back the recorded section with the same unit.

Adjustment procedure

4) Adjust RT606 to remove vertical jitter in the still play picture on the monitor TV.

EP Vert Drive Pulse: RT603

State of VTR

5) Load a blank tape and record in the EP mode, then rewind the tape and play back the recorded section with the same unit.

Adjustment procedure

6) Adjust RT603 to remove vertical jitter in the still play picture on the monitor TV.

3. LINEAR AUDIO CIRCUIT ADJUSTMENT

1. Linear Audio Playback Gain Adjustments

L-ch Linear Audio playback gain: RT501L
R-ch Linear Audio playback gain: RT501R

This adjustment sets the output level of the linear audio signal to the specified level.

L-ch Linear Audio Playback Gain: RT501L

Connecting test equipment

1) Connect a VTVM to the L-ch audio output jack.

State of VTR

2) Load the instrument with an alignement tape and playback the 1 kHz audio signal.

Adjustment procedure

3) Adjust RT501L for –8 dBm.

R-ch Linear Audio Playback Gain: RT501R

Connecting test equipment

4) Connect the VTVM to the R-ch audio output jack.

State of VTR

5) Load the instrument with an alignment tape and playback the 1 kHz audio signal.

Adjustment procedure

6) Adjust RT501R for –8 dBm.

2. Audio Bias Level Adjustments

L-ch Audio bias level: RT502L
R-ch Audio bias level: RT502R

Optimum audio record bias is regulated by this adjustment. If the level is too low, high frequencies are increased, resulting in distortion. If the level is too high, high frequencies are attenuated.

State of VTR

1) Load a blank tape and set the VTR to the no signal record mode in the SP mode.

L-ch Audio Bias Level

Connecting test equipment

2) Connect the VTVM between TP501L and TP502L.

Adjustment procedure

3) Adjust RT502L so that the VTVM reads 2.5 mV ±0.1 mV.

R-ch Audio Bias Level

Connecting test equipment

4) Connect the VTVM between TP501R and TP502R.

Adjustment procedure

5) Adjust RT502R for so that the VTVM reads 2.6 mV ±0.1 mV.

4. FM AUDIO CIRCUIT ADJUSTMENT

Perform the following adjustments after removing the top cover and setting the VTR horizontal.

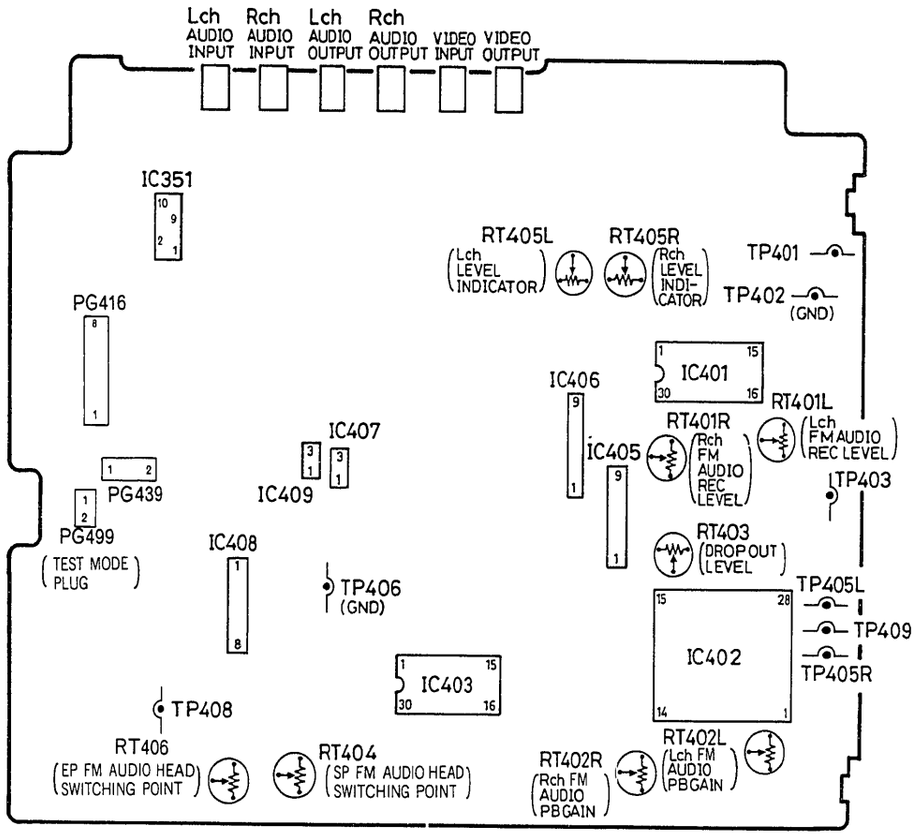


Fig. 4-1 FM Audio Board (Solder Side)

1. FM Audio Switching Point Adjustment

SP FM Audio Switching Point: RT404
EP FM Audio Switching Point: RT406

This adjustment sets the switching point of the FM audio heads to the center where the CH1 and CH2 envelopes overlap in the play mode. If this adjustment is incomplete, the envelope is degraded and noise appears.

Connecting test equipment

1) Connect channel-1 of the oscilloscope to TP403 SW30Hz-A).
2) Connect channel-2 of the oscilloscope to TP405L (FM audio envelope).
3) Connect external trigger probe of the oscilloscope to TP408 (SW30 Hz).

State of VTR

4) Play back the Hi-Fi alignment tape.
5) Observe the waveforms at TP403 (SW30 Hz-A) and TP405L (FM audio envelope).

SP FM Audio Switching Point: RT404

Adjustment procedure

6) Adjust RT404 so that leading or trailing edge of the SW30 Hz-A signal is set to the center of the FM audio envelope and dropout is not present. If the dropout cannot be cancelled, minimize it (less than 0.5H).

EP FM Audio Switching Point: RT406

Adjustment procedure

7) Short-circuit test mode play PG499 to activate the test mode. The VTR operates in the SP mode and only the video heads are switched from SP to EP.
8) Adjust the tracking control so the FM envelope at TP451 is maximum.
9) Adjust RT406 so the trailing edge (leading edge) of SW30Hz-A is set to the center of the FM envelope and the envelope is continuous. If the discontinuity cannot be canceled, minimize the drop to less than 0.5H.

* Readjust the FM audio switching points after performing the head switching point adjustments in the servo circuit.

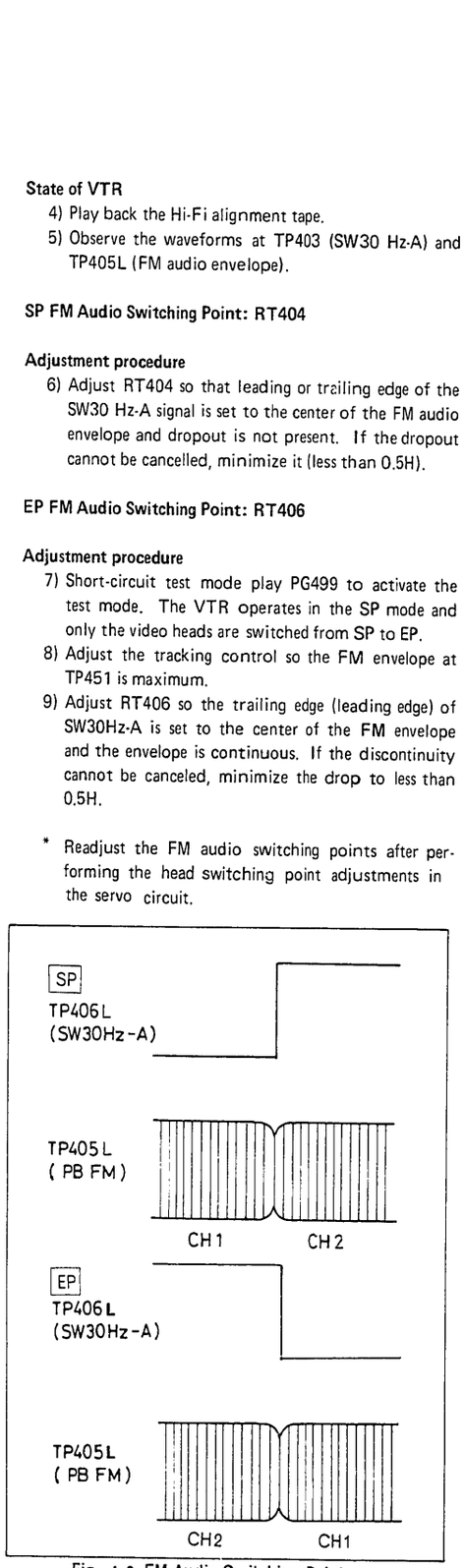


Fig. 4-2 FM Audio Switching Point

* Readjust this FM audio switching point when the switching point in the servo circuit is adjusted.

2. FM Audio Playback Gain Adjustments: LCH: RT402L, RCH: RT402R

These adjustments set the Lch and Rch outputs to the specified values.

Connecting test equipment

1) Connect the VTVM to the Lch, Rch audio output jacks on the rear panel.

State of VTR

2) Play back the Hi-Fi alignment tape.

Adjustment procedure

3) Adjust RT402L (Lch) and RT402R (Rch) respectively so that the reading of the VTVM is −4.8 dBm.

3. Dropout Adjustment: RT403

This adjustment sets the dropout detection level of the FM audio signal.
If this adjustment is incomplete and the level is too high, the dropout detector responds to small dropouts in the envelope and noise may appear. On the other hand, if the level is too low, dropouts cannot be compensated, the Hi-Fi audio may not be muted when the tracking control is turned, or Hi-Fi audio may not be switched to linear audio when the envelope is missing.

Connecting test equipment

1) Connect the DC voltmeter to test point terminal TP409.

State of VTR

2) Play back the alignment tape.

Adjustment procedure

4) Adjust RT403 so that the voltmeter reads 3.3±0.1V.

4. FM Audio Record Level Adjustment

Lch FM Audio Rec Level: RT401L
Rch FM Audio Rec Level: RT401R

This adjustment sets the record current. If this adjustment is incomplete and the level is too high, the video S/N deteriorates and when the level is too low, the audio (Hi-Fi) S/N deteriorates.

Connecting test equipment

1) Connect the oscilloscope to test point terminal TP402 (TP401. GND).

State of VTR

2) Load a blank tape and set the VTR to the no signal record mode in the SP mode.

Adjustment procedure

3) Turn RT401R fully clockwise to minimize the Rch output signal.
4) Adjust RT401L so that the oscilloscope reads 40 mVp-p.
5) Adjust RT401R so that the oscilloscope reads 160 mVp-p.

5. Level Indicator Adjustments

Lch level meter: RT405L
Rch level meter: RT405R

These adjustments set the level meter indications. If these adjustments are incomplete, the Lch input level is not the same as the Rch input level.

Note:
Align the left and right levels at the LINE OUT jacks using the Record Balance Control as shown below before starting the level indicator adjustment.

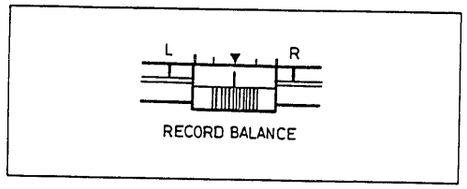


Fig. 4-3 Record Balance Control

Note: 0 dB indication
0 dB is indicated when 2 red LEDs near the green LEDs light for each channel.

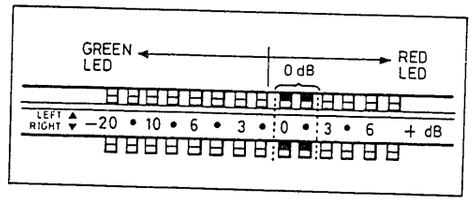


Fig. 4-4 Recording Level Indicators

Lch Level Indicator: RT405L
Connecting test equipment

1) Connect the VTVM to the Lch audio output jack on the rear panel.
2) Connect the oscillator to the Lch audio input jack and feed a 1 kHz signal.

State of VTR

3) Set the V.TR to the EE mode.

Adjustment procedure

4) Turn the record level control to adjust so that the VTVM reads −4.8 dBm.
5) Adjust RT405L so that the Lch level meter indicates 0 dB.
6) Lower the oscillator output level by 1 dBm and check that the "0 dB" indicator of the Lch level meter goes off.
(If it does not go off, readjust 5) and 6).)

Rch Level Indicator: RT405R
Connecting test equipment

1) Connect the VTVM to the Rch audio output jack on the rear panel.
2) Connect the oscillator to the Rch audio input jack on the rear panel.

State of VTR

3) Set the VTR to the EE mode.

Adjustment procedure

4) Turn the record level control to adjust so that the VTVM reads −4.8 dBm.
5) Adjust RT405R so that the Rch level meter indicates 0 dB.
6) Lower the oscillator output level by 1 dBm and check that the "0 dB" indicator of the Rch level meter goes off.
(If it does not go off, readjust 5) and 6).)

5. Y/CHROMA CIRCUIT ADJUSTMENT

Perform adjustment after removing the top cover.

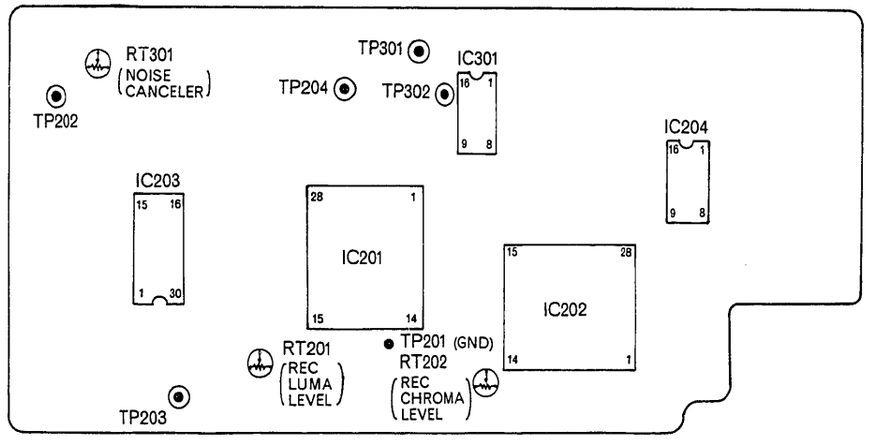


Fig. 5-1 Y/Chroma Board (Solder Side)

1. Record Chroma Level Adjustment: RT202

This adjustment sets the optimum chroma level when recording. If this adjustment is incomplete and the level is too high, diamond beats appear in the played back picture, and when it is too low, the chroma S/N ratio deteriorates causing poor color.
The optimum record chroma level differs depending on the number stamped on the upper cylinder as shown in Fig. 5. Check this number and determine the record chroma level when replacing the video heads or the components in the luminance/chroma signal system.

Connecting test equipment

1) Connect the color bar generator to the video input jack on the rear panel ano feed a color bar signal.

State of VTR

2) Load a blank tape and record in the EP mode.
3) Turn RT201 (record luminance level) fully clockwise viewed from the pattern side so that the luminance level is minimum.
4) Connect the oscilloscope to TP202.

Adjustment procedure

5) Adjust RT202 so that the chroma record level shown in Fig. 9 is set to the value shown in Fig. 10.
6) Adjust the record luminance level in sequence after this adjustment is completed.

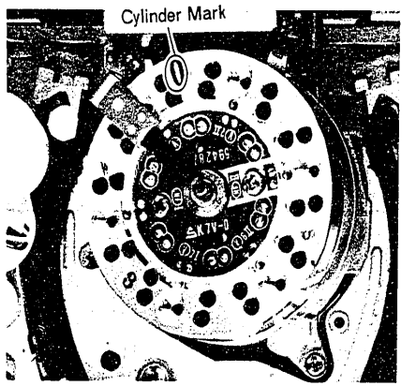


Fig. 5-2 Upper Cylinder Mark Location

Cylinder Mark	Level
0, 1	30 mVp-p
2 – 4	35 mVp-p

Table 1 Record Chroma Level

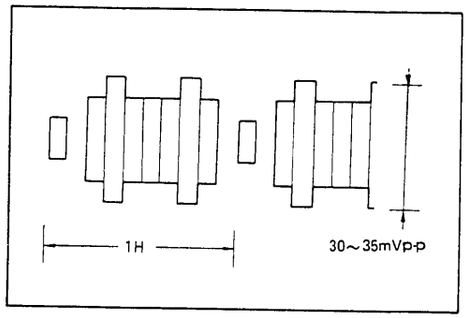


Fig. 5-3 Record Chroma Level

2. Record Luminance Level Adjustment: RT201

This adjustment sets the optimum luminance level when recording. If this adjustment is incomplete and the level is too high, the black/white inversion phenomenon may occur or the S/N ratio is degraded causing a rough picture. If it is too low, the S/N ratio is degrated.

Connecting test equipment

7) Perform the same connection as in the previous record chroma level adjustment.
8) Adjust RT201 to obtain 100 mVp-p at the sync tip.

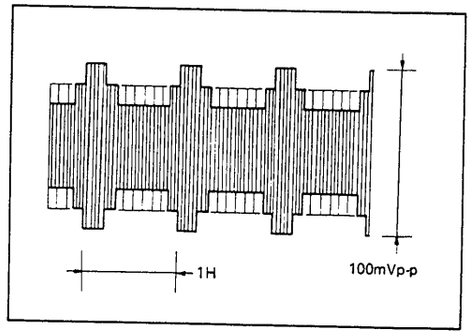


Fig. 5-4 Record Luminance Level

3. Noise Canceler Adjustment: RT301

This adjustment removes noise from the video signal during play.

Connecting test equipment

1) Connect channel-1 of the oscilloscope to TP301.
2) Connect channel-2 of the oscilloscope to TP302.

State of VTR

3) Play back the alignment tape

Adjustment procedure

Observing the oscilloscope, adjust RT302 so that level B (white 100% from pedestal) at TP302 is the same as level A at TP301.
Adjustment tolerance should be within ±5%.

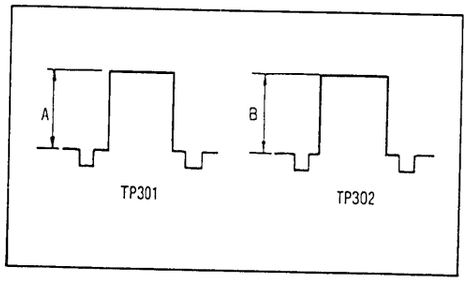


Fig. 5-5 Noise Canceler

6. TUNER/IF CIRCUIT ADJUSTMENT

Preparation

Remove three (3) screws holding the tuner IF pack and disconnect two (2) connectors (PG301, PG303) on the tuner/IF circuit board, then remove the tuner IF pack from the chassis.

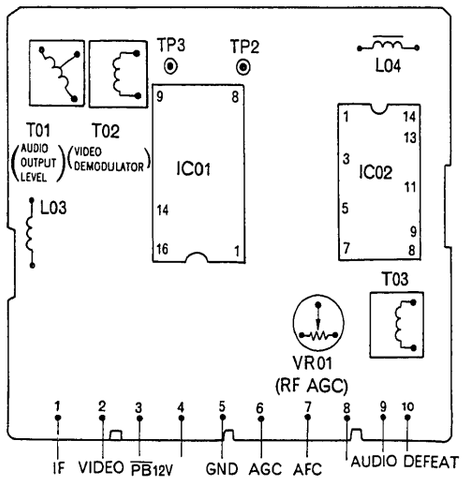


Fig. 6–1 IF Pack (Parts Side)

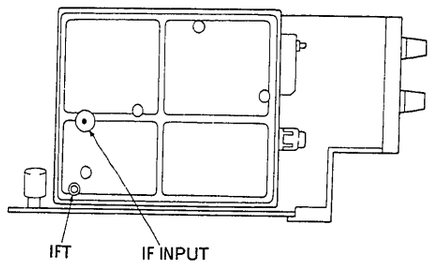


Fig. 6–2 Tune Pack (Parts Side)

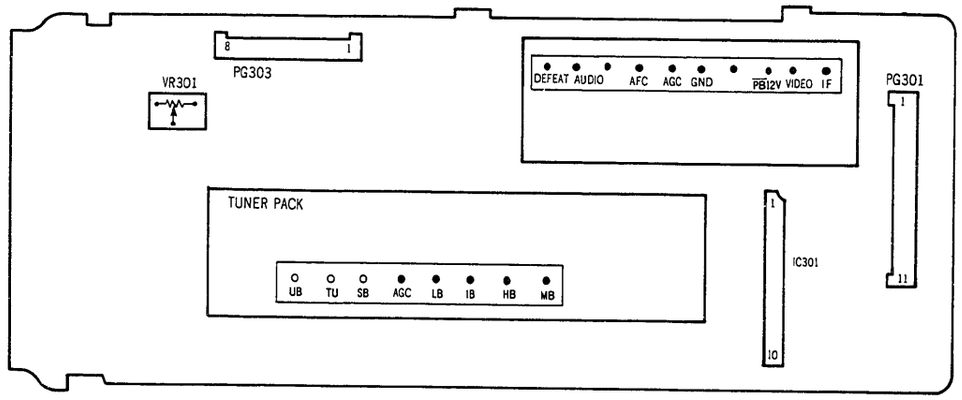


Fig. 6–3 Tune IF P.C. Board (Parts Side)

1. Tuner - IF Adjustment: (Figs. 6-4, 6-5)

Position to be adjusted: Tuner IFT

Position to be measured: L02 LEAD (Connect an oscilloscope)

Connecting test equipment

1) Apply 12.5V (regulated voltage power supply) between IF block pin (+B) and GND.
2) Connect a 50 - 100 ohm resistor between TP2 and TP3.
3) Connect the IF sweep marker generator output to the mixer input pin of the tuner block via the coupling circuit.
4) Apply 9.5 ±0.1 VDC to IC01-(14).
5) Adjust the sweep marker generator output so that the amplitude of the waveform on the oscilloscope is approx. 3 Vp-p.

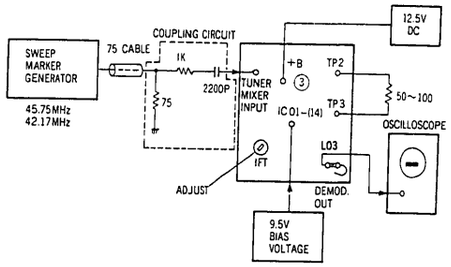


Fig. 6-4 Tuner-IF

Adjustment procedure

6) Adjust Tuner IFT so that the level ratio $\frac{C}{P}$ between P (45.75 MHz) and C (42.17 MHz) of the IF waveform. (Fig. 6-2)

$$\frac{C}{P} = -3 \text{ dB} \pm 1.0 \text{ dB}$$

7) Remove the 50 - 100 ohm resistor connected between TP2 and TP3 after adjustment is completed.

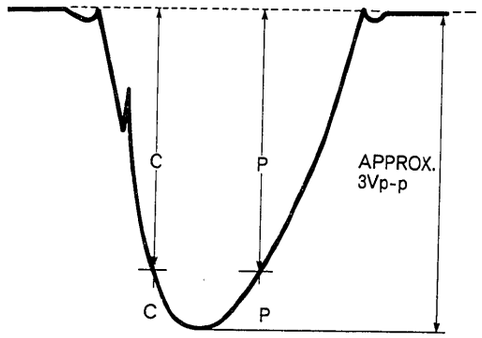


Fig. 6-5 Tuner IF Curve Adjustment

2. Video Demodulator Adjustment: (Fig. 6-6)

Position to be adjusted: T02

Position to be measured: L03L LEAD (Oscilloscope: DC range, probe x 10)

Connecting test equipment

1) Apply 12.5 VDC between IF block pin 3 and GND (soldering).
2) Apply IF bias voltage 8.5 VDC between IC01 - 14 and GND.
3) Set the frequency of the signal generator (SG) to 45.7 MHz ±10 kHz, and input it to the IF input pin of the IF block via the coupling circuit.
4) Minimize the SG output (or disconnect the SG). Adjust the vertical position of the oscilloscope so that the bright line is set to the center.
5) Adjust the SG output so that the bright line drops by −1.3V ±0.2 VDC from the position of the bright line shown in 2.3.4.

Adjustment Procedure

6) Adjust T02, so that the DC voltage is lowest. When the voltage drops exceeding −1.3V ±0.2V, adjust the SG output so that the DC voltage drop is within −1.3V ±0.2 VDC.

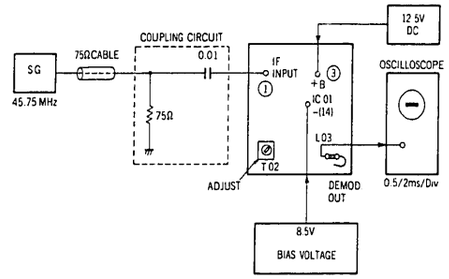


Fig. 6-6 Video Demodulator

3. AFC Adjustment (Fig. 6-7)

Position to be adjusted: T01

Position to be measured: IF block pins 7, 8 (with oscilloscope connected, DC range, dual trace)

Connecting test equipment

1) Apply 12.5 V between IF block pin 3 and GND.
2) Connect the SG output between IF block pins 1 and 5 via the coupling circuit.
3) Connect CH-1 of the oscilloscope to pin 7 and CH-2 to pin 8 (1V/2ms/div.).
4) Set the SG frequency to 45.75 MHz ±10 kHz and the output level to approx. 90 dBμ.

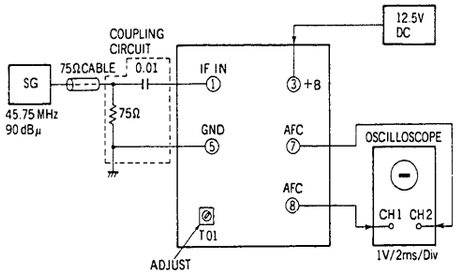


Fig. 6-7 AFC Adjustment

Adjustment procedure

5) Adjust T01 so that the DV voltage at IF block pins 7 and 8 are the same.
6) Check that the voltage at pin 7 drops (to approx. 1.5V) when the SG frequency is adjusted so as to be higher.

4. Audio Output Level

Position to be adjusted; T 03

Position to be measured: IF block pin 9 (AUDIO OUT), VTVM (milivoltmeter)

Connecting test equipment

1) Perform connections shown in Fig. 6-8.
2) Connect a VTVM (millivoltmeter to IF block pin 9)

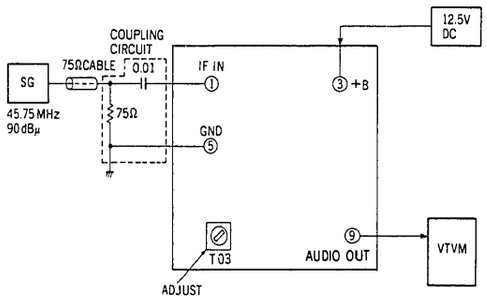


Fig. 6-8 Audio Output Level

Adjustment procedure

3) Adjust the TV IF modulator to modulate the audio signal to 400 Hz, 30%. (7.5 kHz deviation)
4) Adjust the Audio Level Control (T03) for 116mV~163mV.

5. RF AGC Adjustment (Fig. 6-9)

Position to be adjusted: VR801

Position to be measured: IF block pin 6 (AGC OUT), DC voltmeter

Connecting test equipment

1) Connect the tuner IF block to the chassis.
2) Set the VTR/TV selector switch to "VTR".
3) Set the RF output of the colorbar generator to 70 dBμ (75 terminator), and connect it to the VHF ANT terminal.
4) Connect the VTR and monitor TV.
5) Press the channel selector button to receive the colorbar signal and heat-run for 5 minutes.
6) Connect the DC voltmeter to IF block pin 6.

Adjustment procedure

7) Adjust VR801 so that the voltage output from IF block pin 6 is 6.0V ±0.4 VDC.

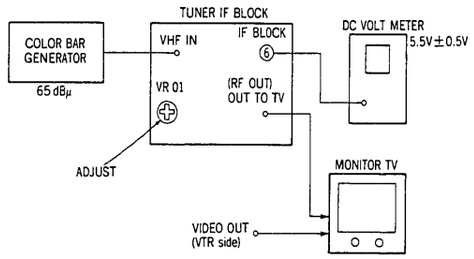


Fig. 6-9 AGC Adjustment

CHAPTER 4

MECHANISM ADJUSTMENT

1. MECHANISM STATE SWITCH ADJUSTMENT

The mechanism state switch is positioned near the loading gear at the bottom of the chassis, and detects the loading conditions of the mechanism to control the loading motor. When this switch is not installed correctly, loading is not performed correctly and the mechanism does not operate normally.

Perform adjustment at the position where the switch detects the STOP mode.

1) Turn the worm pulley counterclockwise until it stops.
2) Loosen the mechanism state switch fixing screw and slide the switch in directions a and b.
3) Tighten the screw at the position where the "V" groove (outside) of the STOP mode and the triangular hold of the switch knob are aligned.
   Tolerance should be less than 0.15 mm in direction a from the center of the "V" groove and less than 0.25 mm in direction b. Be sure the perform adjustment while observing from immediately above.

Operation check

Load a blank tape and check that loading/unloading are performed quickly in all modes. When any malfunction occurs, perform readjustment.

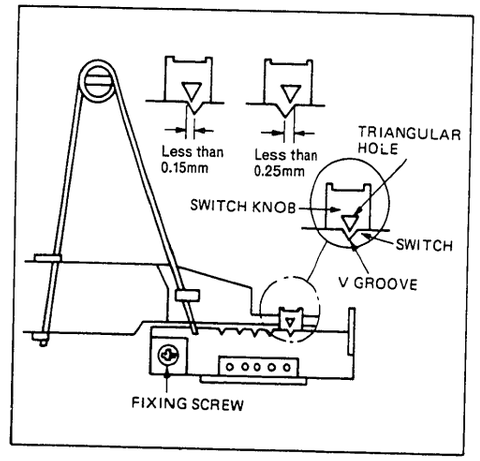


Fig. 1 Mechanism State Switch

2. TAPE TRANSPORT SYSTEM COMPONENTS CHECK/ ADJUSTMENT

The tape transport system is the path from the supply reel disk to the take-up reel disk via the video heads. The tape transport components, especially the components which come into direct contact with the tape, should be kept clean without damage, dust and oil, etc. on the contact surfaces.

The tape transport system is adjusted before shipment from factory, so when any transport components are replaced, the transport system is stabilized by correctly adjusting the new components.

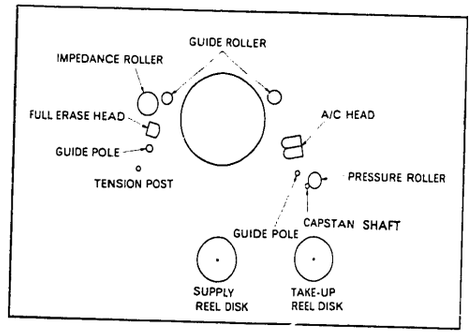


Fig. 2-1 Tape Transport System Components

1. Reel Disk Height Adjustment

1) Remove the top cover and chassis holder, and mount the master plane.
2) Place a reel disk height jig on the master plane and fit it to the reel disk.
3) Check that the top of the reel disk is positioned between sections A and B of the reel disk height jig.
4) When the top of the reel disk is not positioned between sections A and B, adjust the number of spacers (2 types: 0.25 mm and 0.5 mm thick) at the bottom of the reel disk.

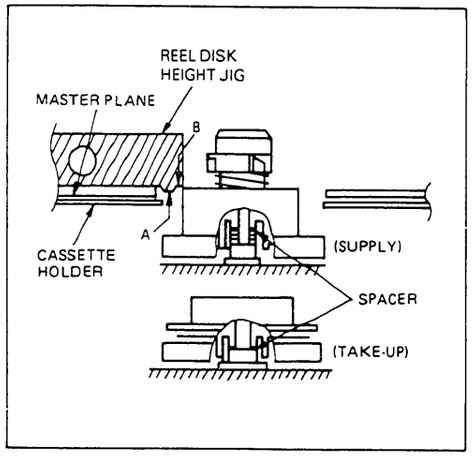


Fig. 2-2 Reel Disk

2. Tension Pole Position/Tension Adjustment

Adjust the tension pole position and tension together, and check the position and tension.
Perform this adjustment with the top cover removed.

Position adjustment

1) Press the play button without loading a cassette and set the VTR to the loading state. (See "How to set the VTR to the loading state without inserting a cassette".)
2) Loosen the tension band bracket fixing screw and insert a flat head screwdriver into the groove between the bracket and chassis.
3) Slide the tension band bracket using the screwdriver to set the gap between the tension pole and chassis to 1 – 2 mm.
4) Tighten the bracket fixing screw.
5) Perform loading again without inserting a cassette after adjustment is completed, and check the tension pole position again.

Tension adjustment

1) Loosen the spring holder fixing screw.
2) Load the tension cassette and play it back in the SP mode.
3) Set the reading of the tension cassette to 30 – 40 g-cm (standard value).
4) When the reading of the cassette is higher than the standard value, move the tension arm spring hook in direction a and hang the hook, and when the reading is lower, move it in direction b, to set to the standard value.
5) Check the tension pole position again when the tension is changed by more than 6 g-cm. When the tension pole position is drifted, readjust the position and tension.
6) Remove the paper covering the sensor after adjustment is completed.

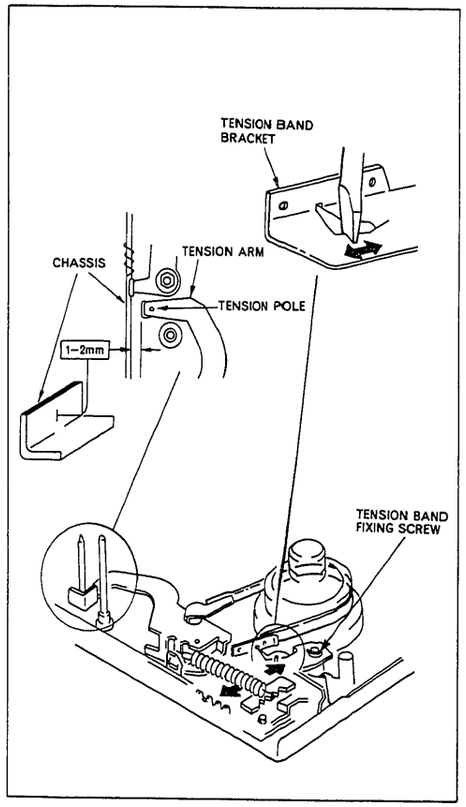


Fig. 2-3 Tension Pole Position/Tension Adjustment

3. Guide Pole (Supply) Height Adjustment

1) Remove the top cover and chassis holder, and mount the master plane.
2) Place a reel disk height jig on the master plane and fit it to the guide pole.
3) Turn the guide pole height adjusting nut so that the gap between the upper flange of the guide pole and the top of the jig is 0.1 ±0.1 mm.
4) Load a blank tape, run it and check that the tape does not ride over the upper and lower flanges of the pole.
5) When the tape rides over either of them, adjust the guide pole height. When the tape rides over the upper flange, turn the nut counterclockwise, and when it rides over the lower flange, turn the nut clockwise, to move the guide pole up and down to eliminate the riding over of the tape.

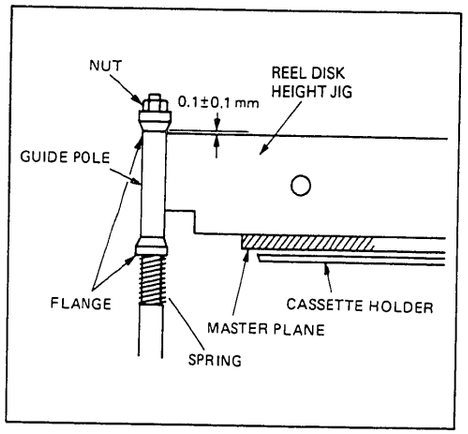


Fig. 2-4 Guide Pole

4. Guide Roller Height Adjustment

1) Remove the top cover and chassis holder, and mount the master plane.
2) Place a reel disk height jig on the master plane and fit it to the guide roller.
3) Tighten the guide roller fixing screw at the position where the upper flange of the guide roller and the top of the jig are aligned.
4) Run the tape and check that the tape does not curl or ride over, then perform the electrical adjustments.
5) Connect the oscilloscope to TP203 (FM output) on the Y/chroma board.
6) Play back the color bar test tape and set the tracking control to the click position.
7) Check that the FM waveform is flat.
8) Then, check that the FM drops at the start and end of the envelope are equal when the tracking control is turned to the left and right.
9) When the FM drops at the start and end of the envelope are not equal, loosen the guide roller fixing screw and turn the guide roller a little to the left and right so that the envelope is flat.
10) Tighten the fixing screw.

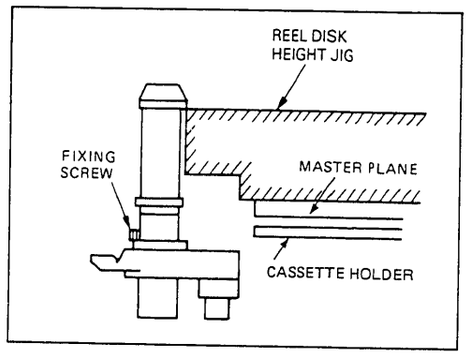


Fig. 2-5 Guide Roller

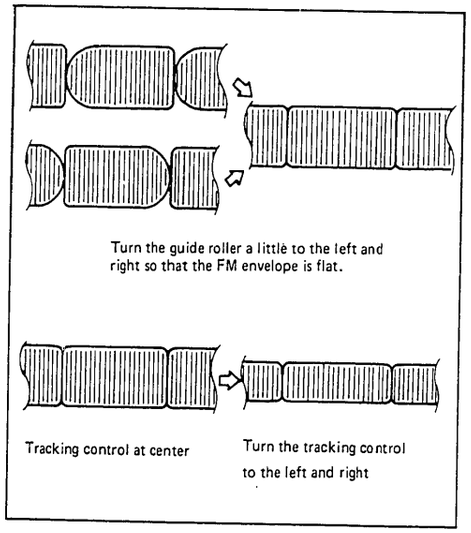

Turn the guide roller a little to the left and right so that the FM envelope is flat.
Tracking control at center
Turn the tracking control to the left and right

Fig. 2-6 FM Output

5. A/C Head Adjustment

Repeat the following adjustments to determine the A/C head installation position, and then adjust the X value.

(1) Tilt adjustment
(2) Azimuth adjustment
(3) Height adjustment

The adjustment below is the procedure when the A/C head is replaced; be sure to perform precise adjustment after rough adjustment.

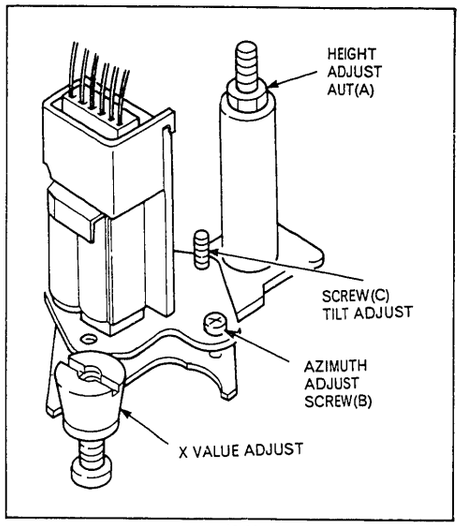


Fig. 2—7 A/C Head

Rough adjustment

1) Tighten the A/C head fixing screw through the bottom of the head base (2) via the spring so that its tip protrudes approx. 3 - 4 mm above the top of head base (1). (Refer to Fig. 2-8.)
2) Adjust the tilt adjusting hexagonal screw and azimuth adjusting screw so that head bases (1) and (2) are in parallel. (Refer to Fig. 2-8.)
3) Remove the chassis holder and mount the master plane.
4) Place the reel disk height jig on the master plane and bring it near the A/C head. Adjust the height adjusting nut so that the gap between the reel disk height jig and the shield case of the A/C head is approx. 0.5 mm. (Refer to Fig. 2-9.)
5) Remove the adjusting jigs, load a blank tape and set the VTR to the play mode. Check that there is no conspicuous curling or riding over of the tape around the A/C head. When, there is, readjust the tilt adjusting hexagonal screw, azimuth adjusting screw and height adjusting nut. When the bottom edge of the tape is approx. 0.1 - 0.15 mm from the lower edge of the control head core, the A/C head height is ideal. (Refer to Fig. 2-9.)

Precise adjustment

Height/Azimuth/Tilt Adjustment (Fig. 2-7, Fig. 2-11)

6) Connect channel-1 ocilloscope to the left channel Audio Out jack.
7) Connect channel-2 to the right channel Audio Out jack.
8) Play back the audio signal on the alignment tape.
9) Adjust height nut (A) for maximum output of both channels.
10) Adjust azimuth screw (B) to match the phase of the two signals as in Fig.
11) Play back the 6 kHz (7 kHz) audio signal on the alignment tape.
12) Adjust tilt screw (C) for maximum audio output.

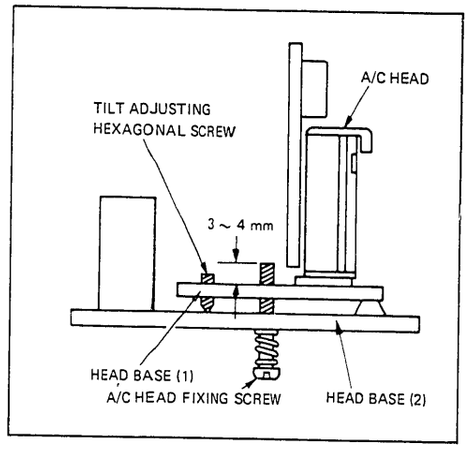


Fig. 2—8 Azimuth/Tilt Adjustments

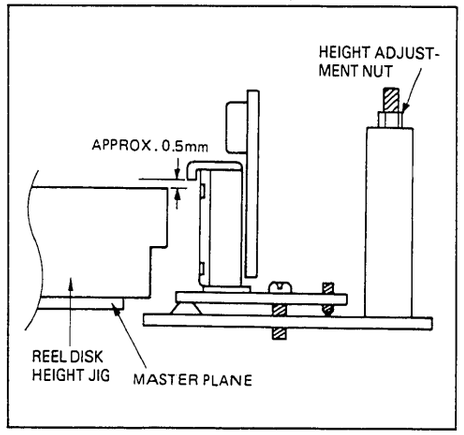


Fig. 2—9 Height Adjustment

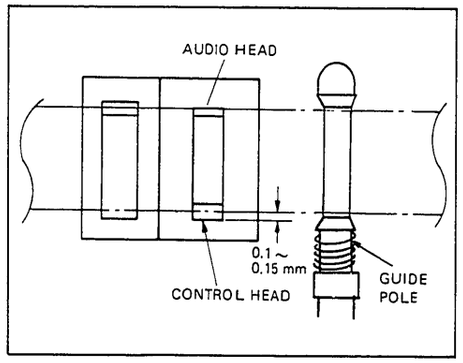


Fig. 2—10 Height Adjustment

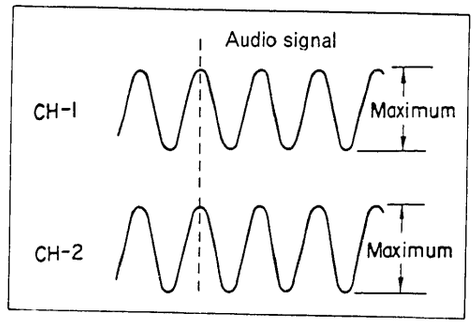


Fig. 2-11 Audio Output

X value adjustment

* Be sure to perform "Tracking Preset Adjustments" before performing this adjustment.

13) Connect the oscilloscope to TP203 (FM output) on the Y/chroma board.
14) Short-circuit testmode plug PG499 (on the FM Audio board)
15) Play back the alignment tape and turn the tracking control on the front panel to the left and right from the click position. Check that the FM output is maximum at the click position and it starts dropping at the same angles on the left and right from the click position. When this is confirmed, the X value has been adjusted.
16) When the X value has not been adjusted, set the tracking control to the click position and adjust the X value adjusting screw so that the FM output is maximum at the click position and it starts dropping at the same angles on the left and right from the click position. (When the FM output starts dropping earlier with the tracking control turned counterclockwise than clockwise, turn the X value adjusting screw counterclockwise.
17) Lock the tilt adjusting hexagonal screw, azimuth adjusting screw and height adjusting nut using paint after adjustment is completed.
18) Release the short-circuit of test mode plug PG499.
19) Adjust the Playback Level and Bias Level described in "ELECTRICAL CIRCUIT ADJUSTMENT".
20) Adjust the guide roller height after this adjustment is completed.

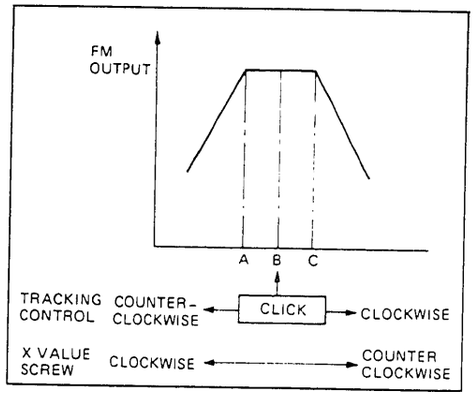


Fig. 2-12 Tracking Characteristics when alignment tape is played back

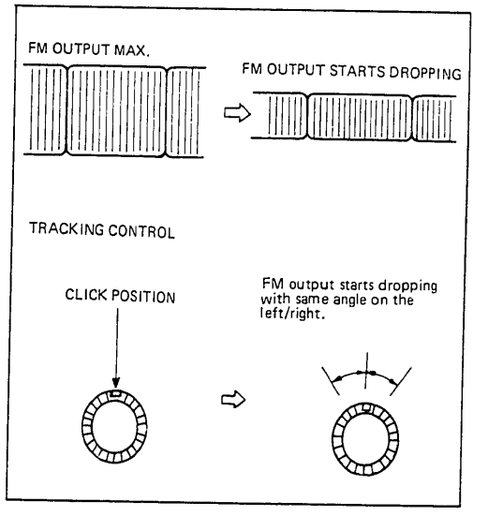

FM OUTPUT MAX.
FM OUTPUT STARTS DROPPING
TRACKING CONTROL
CLICK POSITION
FM output starts dropping with same angle on the left/right.

Fig. 2-13 X Value

3. Adjustment after Replacing Cylinder (Video Heads)

When the cylinder is replaced, the relative height between the cylinder and guide roller and the X value, etc. drifts, so adjustment of the transport system and servo system are required.

However, the drifts in the relative height and X value are very little when the cylinder is replaced normally, they can be corrected by electrical adjustments.

1) Check that no curling or creasing occurs around the guide roller.
   Adjust the guide roller height when they occur.
2) Adjust tracking preset adjustments (system control/servo board).
3) Adjust the X value (described in "A/C Head Adjustment").
4) Check the flatness and level fluctuations of the FM output. The checking method is described later.
5) Adjust the servo circuit, Y/chroma circuit and FM audio circuit.

① Head switching point adjustment (Main board)
② Record luminance/chroma level adjustments (Y/chroma board)
③ FM audio switching point adjustment (FM/audio board)

Checking flatness and load fluctuations of the FM output

1) Set the tracking control to the click position.
2) Fine adjust the voltage level range of the oscilloscope and set the FM output to 4 graduations.
3) Turn the tracking control to set the maximum amplitude of the FM output to 3 graduations.
4) Check that the minimum amplitude is more than 2 graduations.
5) Check that the level difference between the maximum and minimum amplitudes is less than 13%.

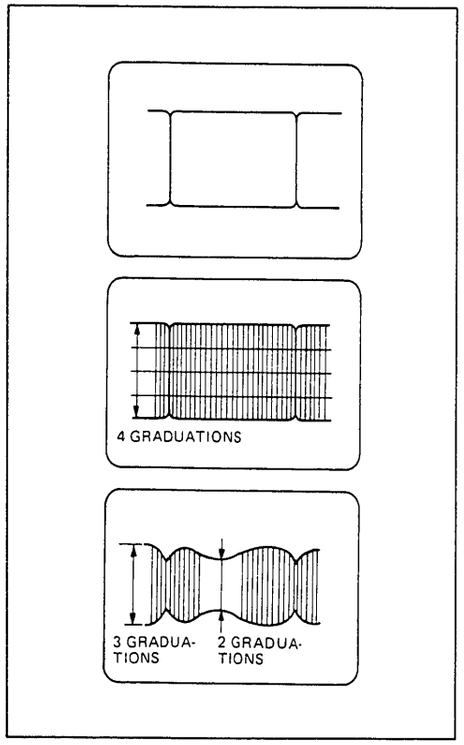


Fig. 2-14 FM Envelope Flatness

4. TENSION AND TORQUE CHECKS

It is necessary to check the tension, torque and compression strength in the tape take-up section and moving section to smoothen the tape transport and to satisfy the basic performance of the VTR. When the tape transport is not smooth or the tape speed is abnormal, perform these checks to complete the work.

Item	VTR Operation Mode	Measured Reel	Measured Value	Remarks
Main brake torque	STOP	Supply/take-up	170g.cm or more	Note 2
Slack removal torque	UNLOADING	Supply reel	200-300 g.cm	Note 4
Fast forward torque	F. FWD	Take-up reel	400g.cm or more	Note 2
Rewind torque	REW	Supply reel	400g.cm or more	Note 2
Take-up torque	PLAY	Take-up reel	70-150 g/cm	Note 4
Back-tension torque	F. FWD	Supply reel	4-15 g.cm	Note 3
	REW			

Note 2: This is the value measured using the torque gauge and torque gauge adapter while sliding the torque gauge at the speed of 0.8 rps. However, the main brake torque shows the value measured while moving the take-up reel clockwise and the supply reel counterclockwise by hand at the speed of 0.8 rps.

Note 3: This is the value measured using the dummy reel and fan type tension gauge while drawing the take-up reel disk counterclockwise and the supply reel disk clockwise at the speed of 50 mm/s.

Note 4: This is the value measured with the torque gauge fixed using the torque gauge and torque gauge adapter.

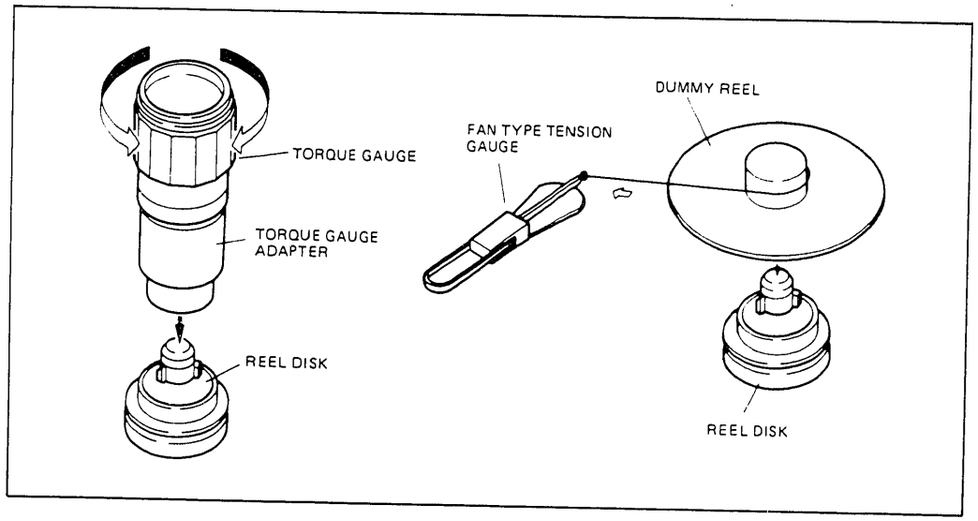


Fig. 4-1 Tension/Torque Measurement

5. HOW TO SET THE VTR TO THE LOADING STATE WITHOUT INSERTING A CASSETTE

Method 1

1) Remove the top cover.
2) Apply paper, etc. to the light receiving ports (A) of the end sensors on both sides of the cassette holder.
3) Lower the cassette holder while pressing tabs (B) on both sides of the cassette holder.
   The VTR can enter every mode in this state.
   However, the rewind operation can be done only for several seconds because the tape-up reel disk is in the stop mode and the reel pulses cannot be detected. Be careful that if the shielding paper, etc. is too thin, the end sensor detects the infrared ray or external light and no mode can be entered.

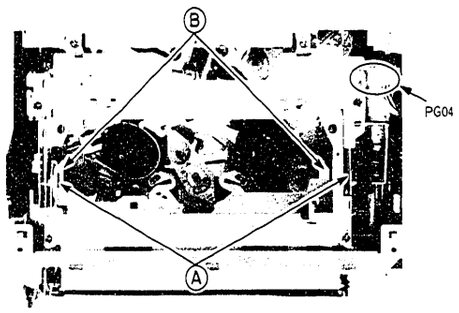


Fig. 5-1

Method 2

1) Remove the top cover.
2) Unplug the power cord of the VTR from the AC outlet.
3) Disconnect the connector (PG04) from the cassette loading motor circuit board.
4) Connect a jumper between pins 2 and 5 of connector (PG4).
5) Plug the power cord of the VTR into the AC outlet.
6) Turn "on" the power switch of the VTR.
7) The above procedure enables to operate the VTR without loading a cassette tape.

Note 1: Operate the play and record buttons simultaneously while pressing the safety tab switch lever in order to place the VTR in the record mode.

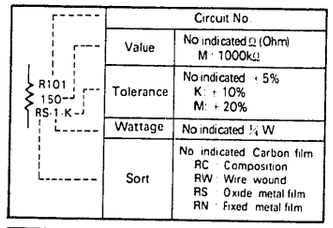
Note 2: After the above operations are completed, disconnect the jumper and connect the connector (PG04) to the cassette loading motor circuit board, then unplug the power cord of the VTR from the AC outlet to reset the system control microprocessor.

CHAPTER 5

SCHEMATIC/CIRCUIT BOARD DIAGRAMS

Note

1 Voltage measured at base of chassis with minimum volume control and no signal.
( ) are shown in recording condition
2 Nomenclature of Resistors and Capacitors



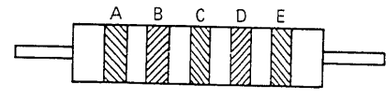
	Circuit No.	
	Value	No indicated Ω (Ohm) M : 1000kΩ
	Tolerance	No indicated : ±5% K : ±10% M : ±20%
	Wattage	No indicated ¼ W
	Sort	No indicated Carbon film RC : Composition RW : Wire wound RS : Oxide metal film RN : Fixed metal film

	Circuit No.		
	Value	No indicated μF P : PF	
	Tolerance	No indicated : ±10% J : ± 5% M : ±20% Z : +80% -20% D : ±0.5pF C : ±0.25pF	
	Sort		Ceramic
			Electrolitic
		M	Mylar
		P	Polyester
		S	Styrol
	Voltage	No indicated 50WV	

3. Be sure to make your orders of resistors and capacitors with value, voltage, tolerance and sort.
4. When replacing capacitors marked With * use specified ones stated on parts list since required temperature characteristics.

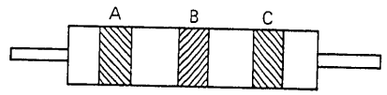
HOW TO READ CAPACITY AND INDUCTANCE OF RESISTOR SHAPE CAPACITORS AND COILS

CAPACITOR



CAPACITY: (10A+B)xC [PF]
TOLERANCE: D
RATED VOLTAGE: BODY COLOR
Pink: 25V
Green: 50V
CHARACTERISTICS: E

COIL



INDUCTANCE: (10A+B)xC [μH]

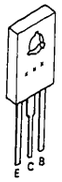
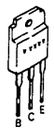
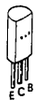
COLOR	A, B	C	D	E
Black	0	10^0	±20%	For temperature compensation
Brown	1	10^1		
Red	2	10^2		
Orange	3	10^3		
Yellow	4	10^4		
Green	5	10^5		
Blue	6			
Violet	7			
Grey	8		±30%	High dielectric constant type
White	9			For temperature compensation
Gold		10^{-1}	± 5%	
Silver		10^{-2}	±10%	High dielectric constant type

Cautions on use of MOS IC

1. The MOS IC is inserted in black foam for shipment. This foam is a conductor which short-circuits between the leads to prevent damage. Do not remove ICs from this foam during their storage. Avoid removing ICs from this foam, placing them on plastic which is likely to be charged with static electricity or inserting them into styrol foam.
2. High voltages may be applied during doldering caused by leakages from the soldering iron, so be sure to ground the tip of the soldering iron or use a low voltage soldering iron.
3. The human body, clothes made of synthetic fibres or nylon gloves may be charged with several thousands volts of static electricity because of friction, so a workers should be grounded.
4. Be sure to ground measuring instruments such as oscilloscopes, VTVMs, etc. used for repairs.

SEMICONDUCTOR CONFIGURATION

TRANSISTOR

1	2	3	4
			
2SC2021RS DTA124F DTC124F	2SA673 2SA952 2SC1740 2SD468	2SA844 2SC458	2SD947
5	6	7	–
			–
2SD1266	2SK186	2SD468	–

IC (SINGLE INLINE PACKAGE)

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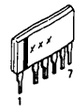	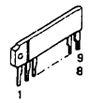	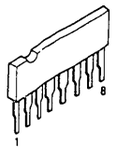	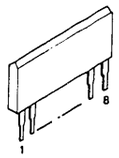
μPC1513HA	LA7910 (9P) LA7016 (8P) NJM4558S (9P) TA7324P (9P)	BA340	M5218L
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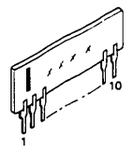	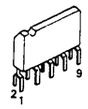	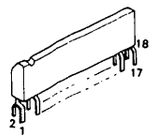	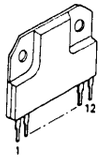
TA4390A	TK15021Z	BA5102AL	M54549L M54548L
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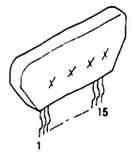	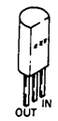	–	–
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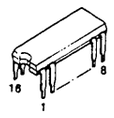	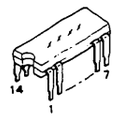
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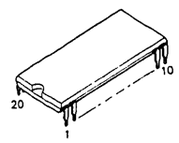	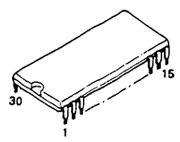
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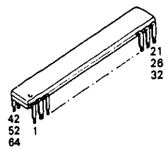	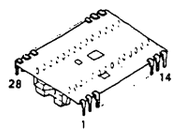
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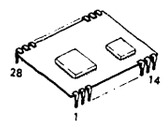
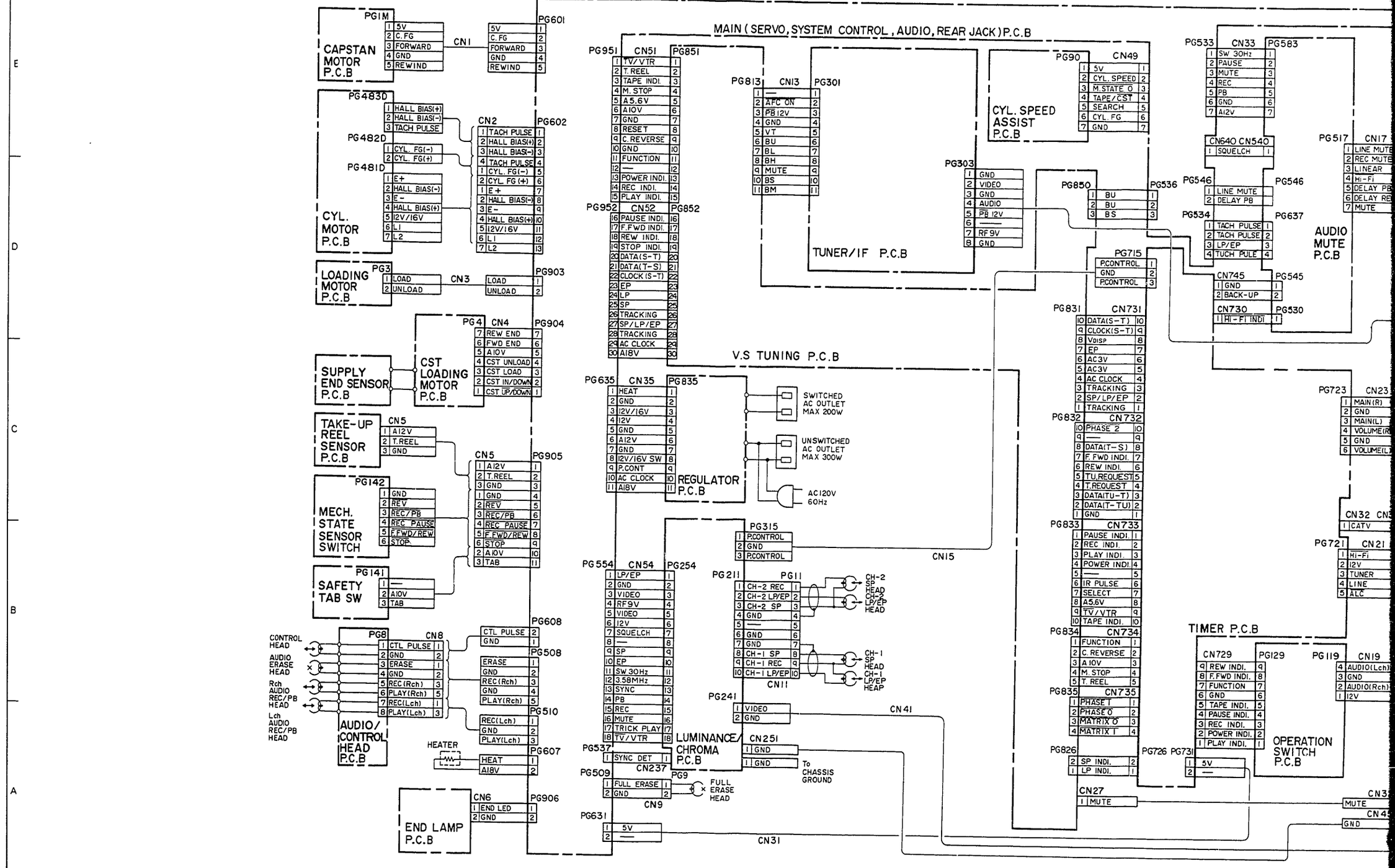
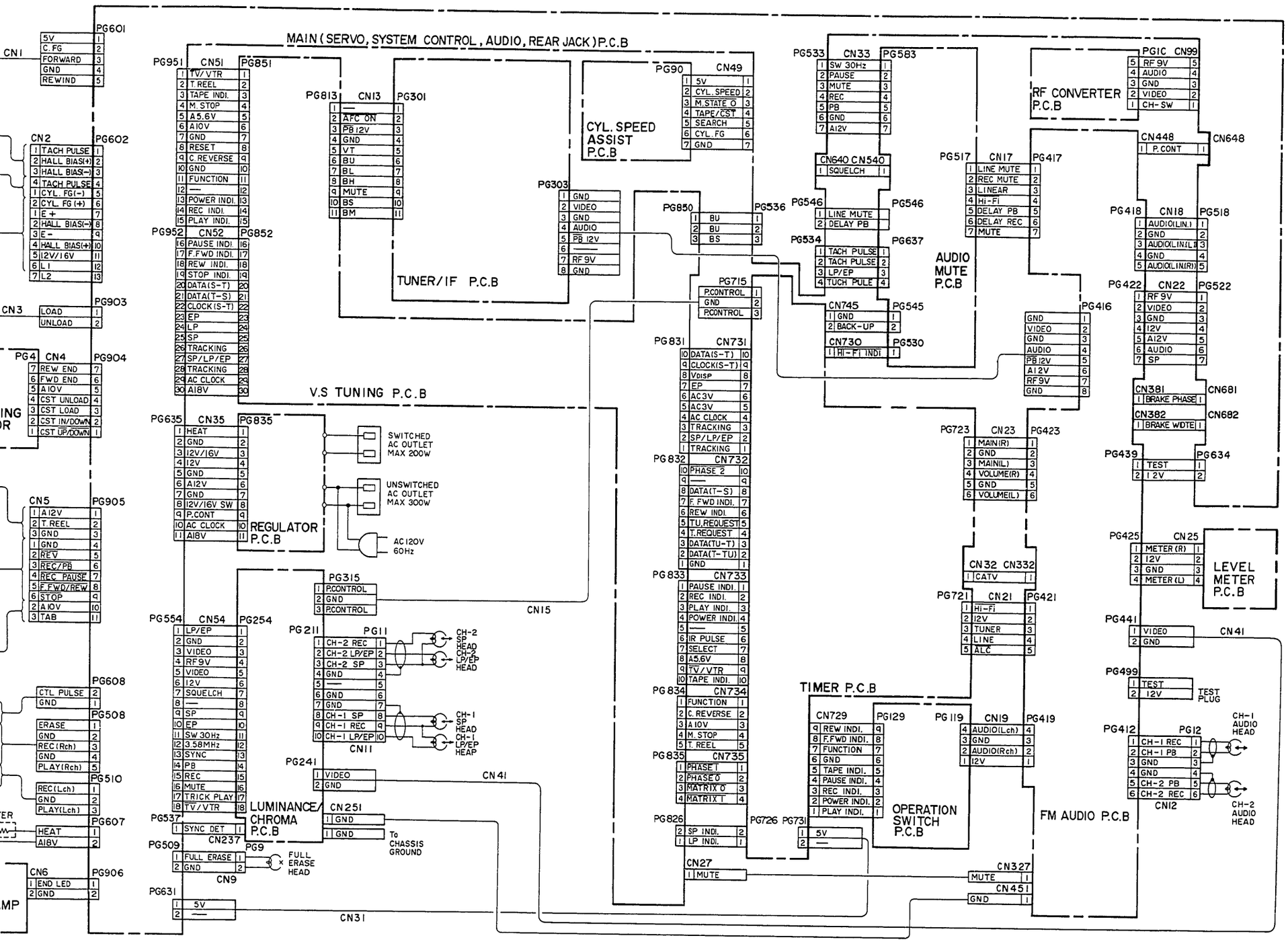
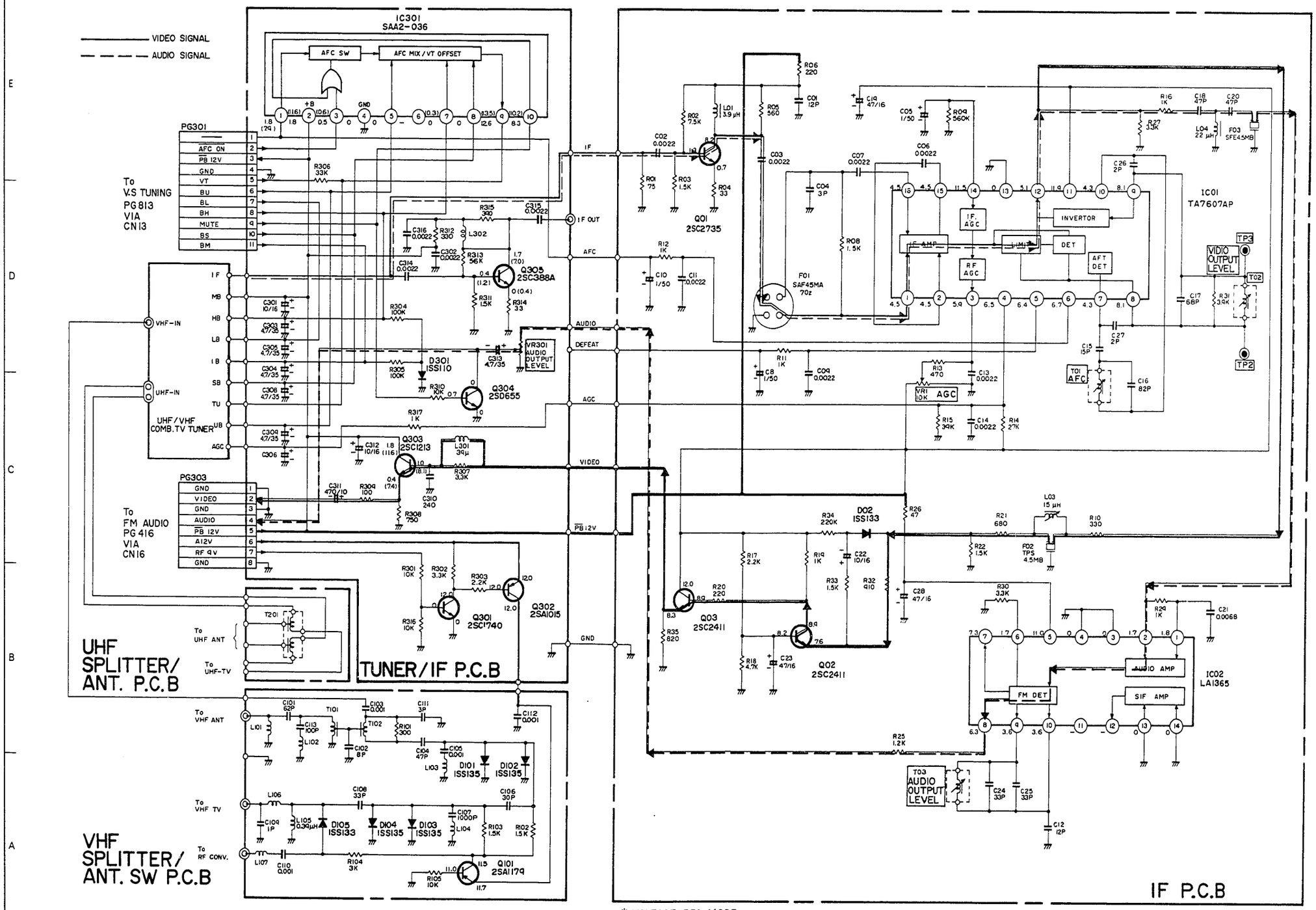
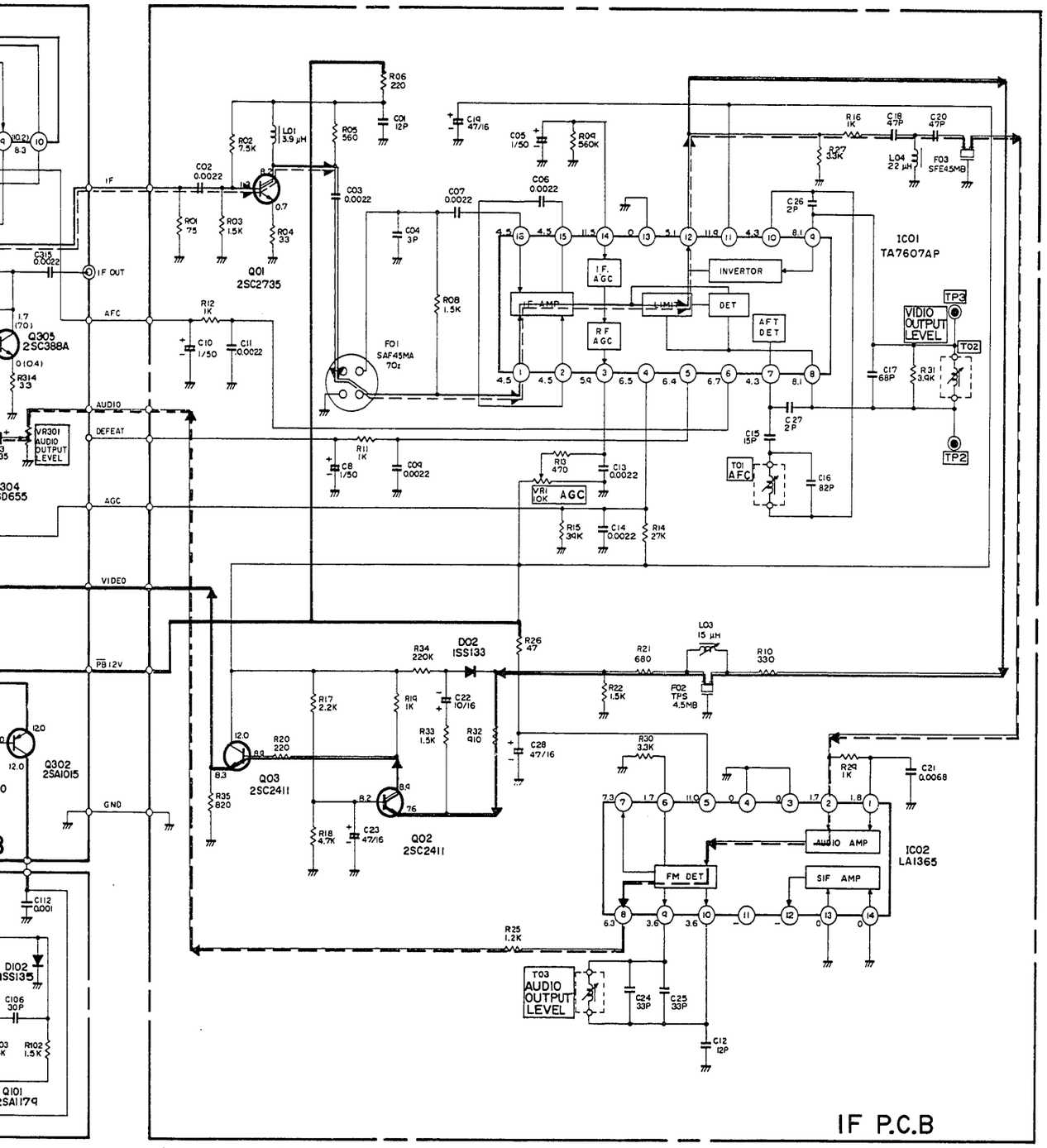
7	**–**
	–
HT6210B	–

INTERNAL WIRING DIAGRAM



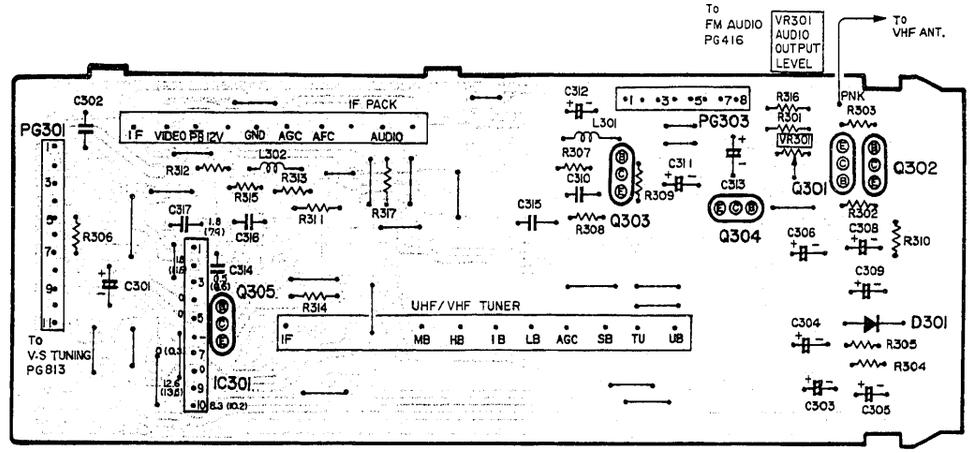

MAIN (SERVO, SYSTEM CONTROL, AUDIO, REAR JACK) P.C.B
CYL. SPEED ASSIST P.C.B
TUNER/IF P.C.B
V.S TUNING P.C.B
REGULATOR P.C.B
LUMINANCE/ CHROMA P.C.B
RF CONVERTER P.C.B
AUDIO MUTE P.C.B
TIMER P.C.B
OPERATION SWITCH P.C.B
FM AUDIO P.C.B
LEVEL METER P.C.B
SWITCHED AC OUTLET MAX 200W
UNSWITCHED AC OUTLET MAX 300W
AC 120V 60Hz
FULL ERASE HEAD
To CHASSIS GROUND
CH-2 SP HEAD
CH-2 LP/EP HEAD
CH-1 SP HEAD
CH-1 LP/EP HEAD
CH-1 AUDIO HEAD
CH-2 AUDIO HEAD
TEST PLUG
PG601 5V C.FG FORWARD GND REWIND
PG602 TACH PULSE HALL BIAS(+) HALL BIAS(-) TACH PULSE CYL. FG(-) CYL. FG(+) E+ HALL BIAS(-) E- HALL BIAS(+) 12V/16V L1 L2
PG903 LOAD UNLOAD
PG904 REW END FWD END A10V CST UNLOAD CST LOAD CST IN/DOWN CST UP/DOWN
PG905 A12V T.REEL GND GND REV REC/PB REC PAUSE F.FWD/REW A10V TAB
PG906 END LED GND
PG608 CTL PULSE GND
PG508 ERASE GND REC(Rch) GND PLAY(Rch)
PG510 REC(Lch) GND PLAY(Lch)
PG607 HEAT A18V
PG951 CN51 PG851 TV/VTR T.REEL TAPE INDI. M.STOP A5.6V A10V GND RESET C.REVERSE GND FUNCTION — POWER INDI. REC INDI. PLAY INDI.
PG952 CN52 PG852 PAUSE INDI. F.FWD INDI. REW INDI. STOP INDI. DATA(S-T) DATA(T-S) CLOCK(S-T) EP LP SP TRACKING SP/LP/EP TRACKING AC CLOCK A18V
PG635 CN35 PG835 HEAT GND 12V/16V GND A12V GND A12V 12V/16V SW P.CONT AC CLOCK A18V
PG554 CN54 PG254 LP/EP GND VIDEO RF9V VIDEO 12V SQUELCH — SP EP SW 30Hz 3.58MHz SYNC PB REC MUTE TRICK PLAY TV/VTR
PG537 SYNC DET CN237
PG509 FULL ERASE GND CN9
PG631 5V — CN31
PG813 CN13 PG301 — AFC ON PB 12V GND VT BU BL BH MUTE BS BM
PG303 GND VIDEO GND AUDIO PB 12V — RF 9V GND
PG315 P.CONTROL GND P.CONTROL CN15
PG211 PG11 CH-2 REC CH-2 LP/EP CH-2 SP GND — GND GND CH-1 SP CH-1 REC CH-1 LP/EP CN11
PG241 VIDEO GND CN41
CN251 GND GND
PG90 CN49 5V CYL. SPEED M.STATE O TAPE/CST SEARCH CYL. FG GND
PG850 PG536 BU BU BS
PG715 P.CONTROL GND P.CONTROL
PG831 CN731 DATA(S-T) CLOCK(S-T) VDISP EP AC3V AC3V AC CLOCK TRACKING SP/LP/EP TRACKING
PG832 CN732 PHASE 2 — DATA(T-S) F.FWD INDI. REW INDI. TU.REQUEST T.REQUEST DATA(TU-T) DATA(T-TU) GND
PG833 CN733 PAUSE INDI. REC INDI. PLAY INDI. POWER INDI. — IR PULSE SELECT A5.6V TV/VTR TAPE INDI.
PG834 CN734 FUNCTION C.REVERSE A10V M.STOP T.REEL
PG835 CN735 PHASE 1 PHASE 0 MATRIX 0 MATRIX 1
PG826 SP INDI. LP INDI.
PG726 PG731 5V —
CN27 MUTE
PG533 CN33 PG583 SW 30Hz PAUSE MUTE REC PB GND A12V
CN640 CN540 SQUELCH
PG546 PG546 LINE MUTE DELAY PB
PG534 PG637 TACH PULSE TACH PULSE LP/EP TUCH PULE
CN745 PG545 GND BACK-UP
CN730 PG530 HI-FI INDI
PG517 CN17 PG417 LINE MUTE REC MUTE LINEAR HI-FI DELAY PB DELAY REC MUTE
PG416 GND VIDEO GND AUDIO PB 12V A12V RF 9V GND
PGIC CN99 RF 9V AUDIO GND VIDEO CH-SW
CN448 CN648 P.CONT
PG418 CN18 PG518 AUDIO(LIN.) GND AUDIO(LIN/L) GND AUDIO(LIN/R)
PG422 CN22 PG522 RF 9V VIDEO GND 12V A12V AUDIO SP
CN381 CN681 BRAKE PHASE
CN382 CN682 BRAKE WDTE
PG723 CN23 PG423 MAIN(R) GND MAIN(L) VOLUME(R) GND VOLUME(L)
PG439 PG634 TEST 12V
CN32 CN332 CATV
PG721 CN21 PG421 Hi-Fi 12V TUNER LINE ALC
PG425 CN25 METER(R) 12V GND METER(L)
PG441 CN41 VIDEO GND
PG499 TEST 12V
PG412 PG12 CH-1 REC CH-1 PB GND GND CH-2 PB CH-2 REC
CN12
CN729 PG129 PG119 CN19 PG419 REW INDI. F.FWD INDI. FUNCTION GND TAPE INDI. PAUSE INDI. REC INDI. POWER INDI. PLAY INDI. AUDIO(Lch) GND AUDIO(Rch) 12V
CN327 MUTE
CN451 GND


VIDEO SIGNAL
AUDIO SIGNAL
IC301
SAA2-036
AFC SW
AFC MIX / VT OFFSET
PG301
AFC ON
PB 12V
GND
VT
BU
BL
BH
MUTE
BS
BM
To
V.S TUNING
PG813
VIA
CN13
IF
MB
HB
LB
IB
SB
TU
AGC
VHF-IN
UHF-IN
UHF / VHF
COMB. TV TUNER
UB
IF OUT
AFC
AUDIO
DEFEAT
VIDEO
GND
Q305
2SC388A
Q304
2SD655
Q303
2SC1213
Q301
2SC1740
Q302
2SA1015
D301
1SS110
VR301
AUDIO
OUTPUT
LEVEL
PG303
GND
VIDEO
GND
AUDIO
PB 12V
A12V
RF AGC
GND
To
FM AUDIO
PG 416
VIA
CN16
T201
To
UHF ANT
To
UHF-TV
UHF
SPLITTER/
ANT. P.C.B
TUNER/IF P.C.B
To
VHF ANT
To
VHF TV
To
RF CONV.
VHF
SPLITTER/
ANT. SW P.C.B
Q101
2SA1179
Q01
2SC2735
F01
SAF45MA
70z
Q03
2SC2411
Q02
2SC2411
D02
1SS133
IC01
TA7607AP
IF AMP
IF AGC
RF AGC
INVERTOR
DET
AFT DET
VIDIO
OUTPUT
LEVEL
TP3
TP2
T02
T01
AFC
VR1
10K
AGC
F03
SFE45MB
F02
TPS
4.5MB
L03
15 µH
T03
AUDIO
OUTPUT
LEVEL
IC02
LA1365
AUDIO AMP
FM DET
SIF AMP
IF P.C.B
※ VOLTAGE: REC MODE.



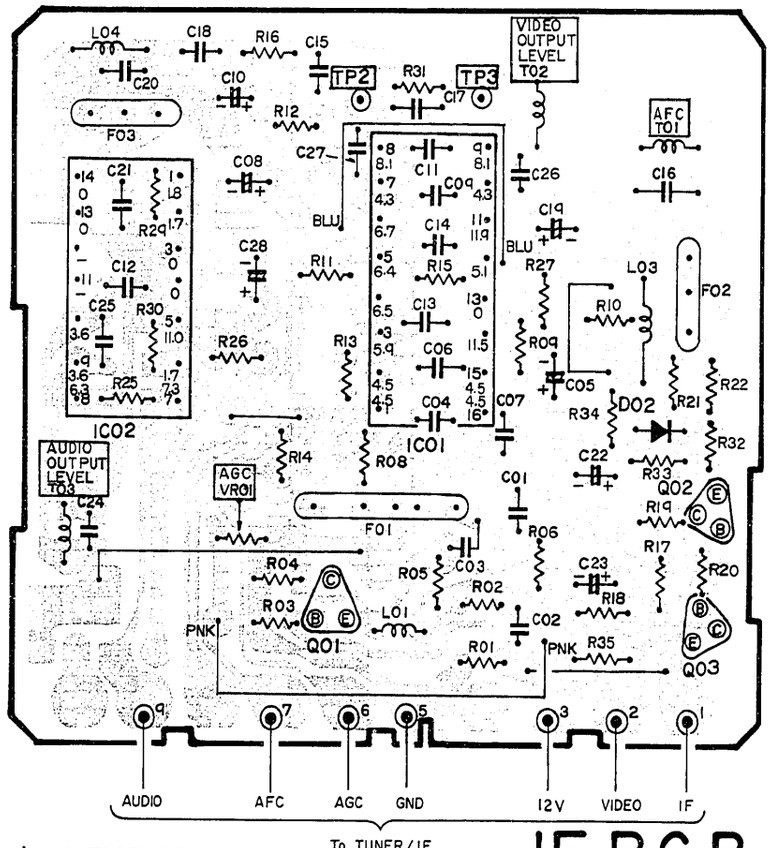
※ VOLTAGE : REC MODE.

IF P.C.B



※ VOLTAGE : REC MODE.

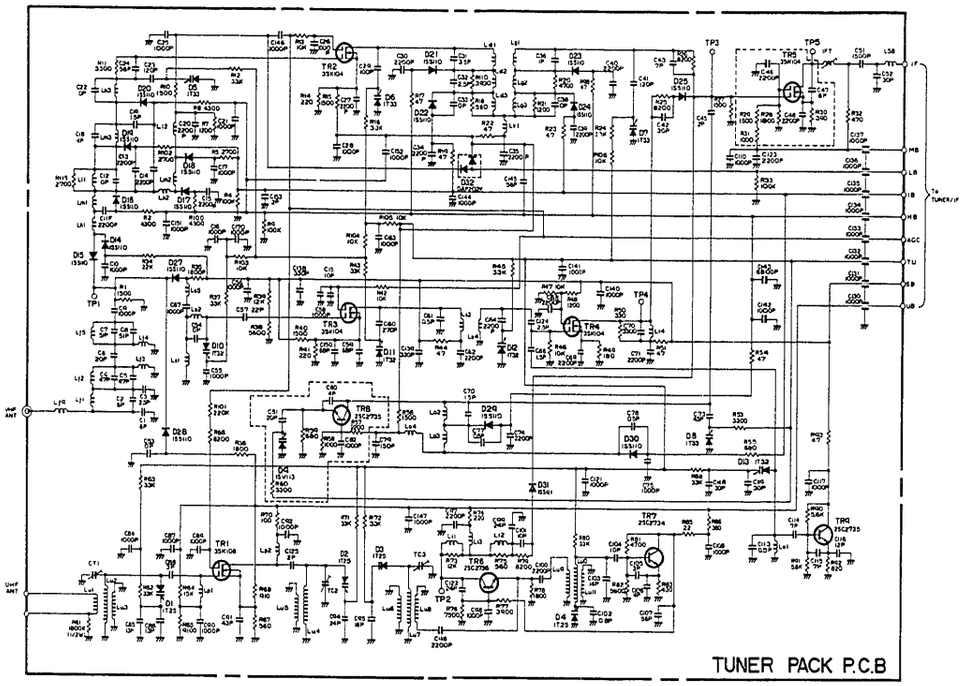
TUNER/IF P.C.B



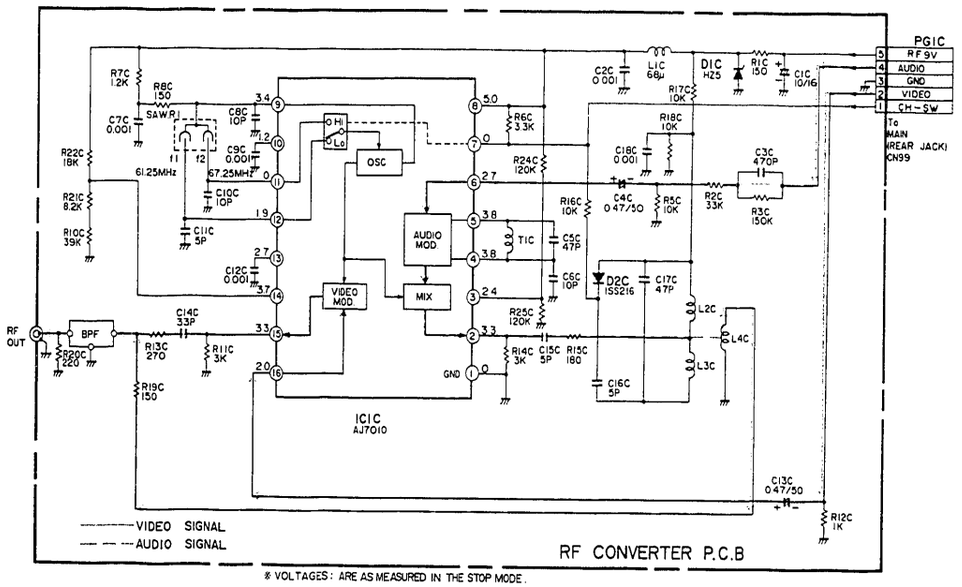
※ VOLTAGE : REC MODE.

IF P.C.B

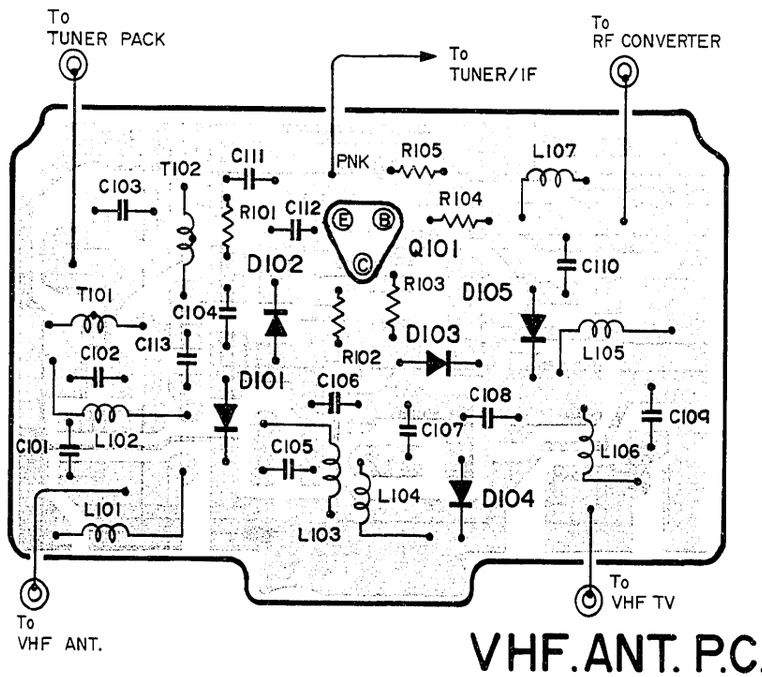
TUNER PACK



RF CONVERTER



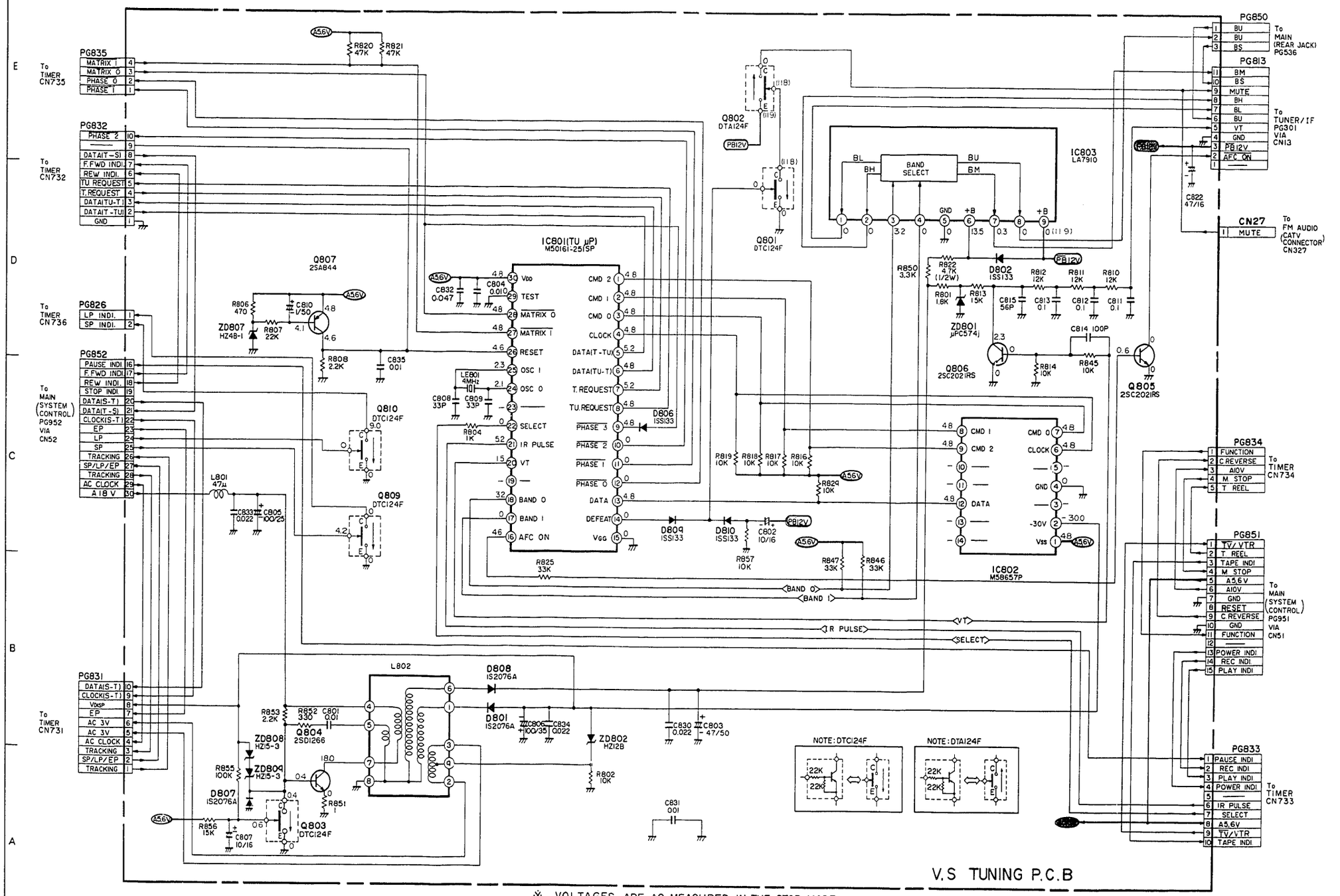
※ VOLTAGES: ARE AS MEASURED IN THE STOP MODE.



VHF.ANT. P.C.B

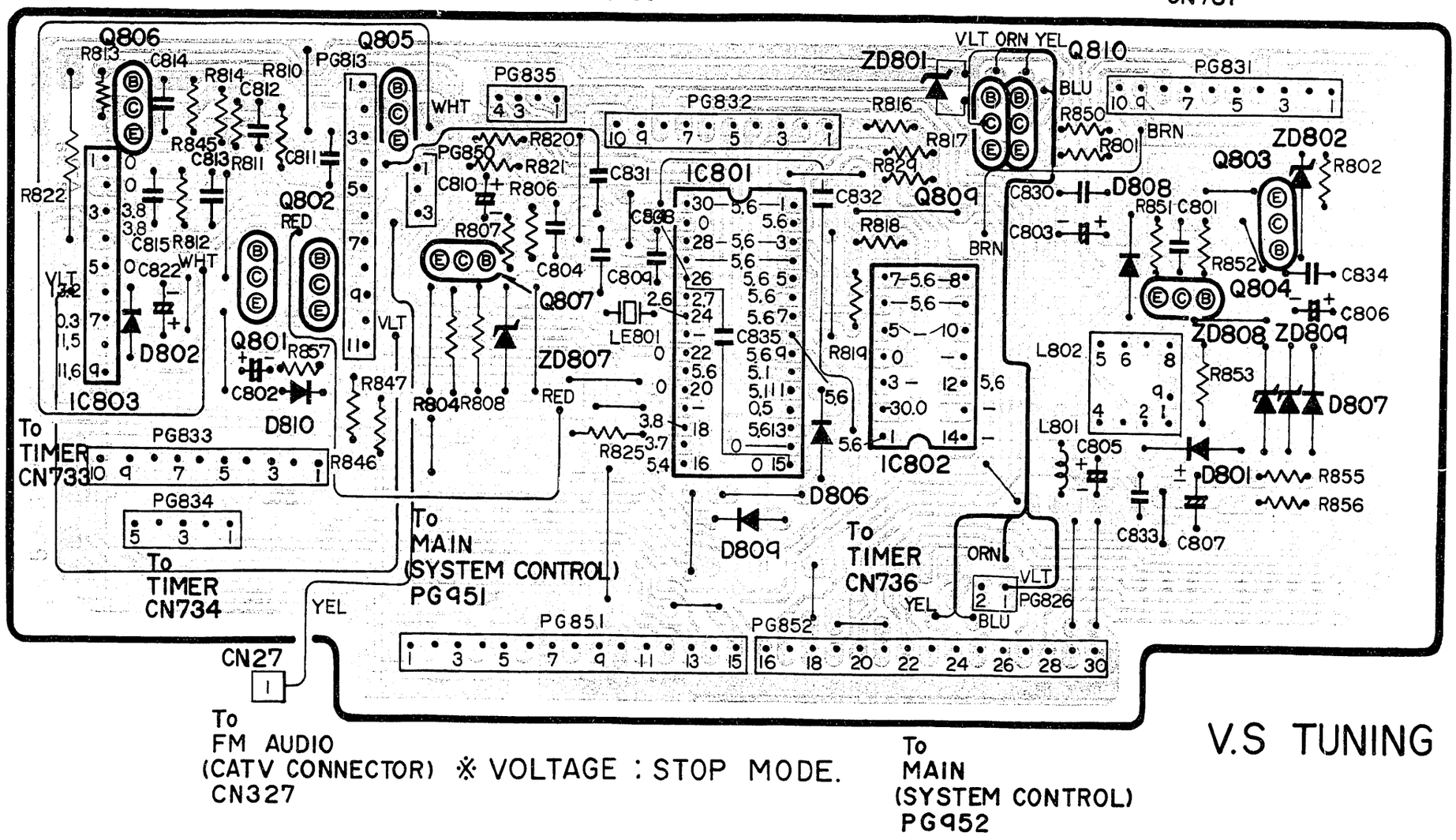
TUNER PACK 5–11 5–12 RF CONVERTER

V.S TUNING

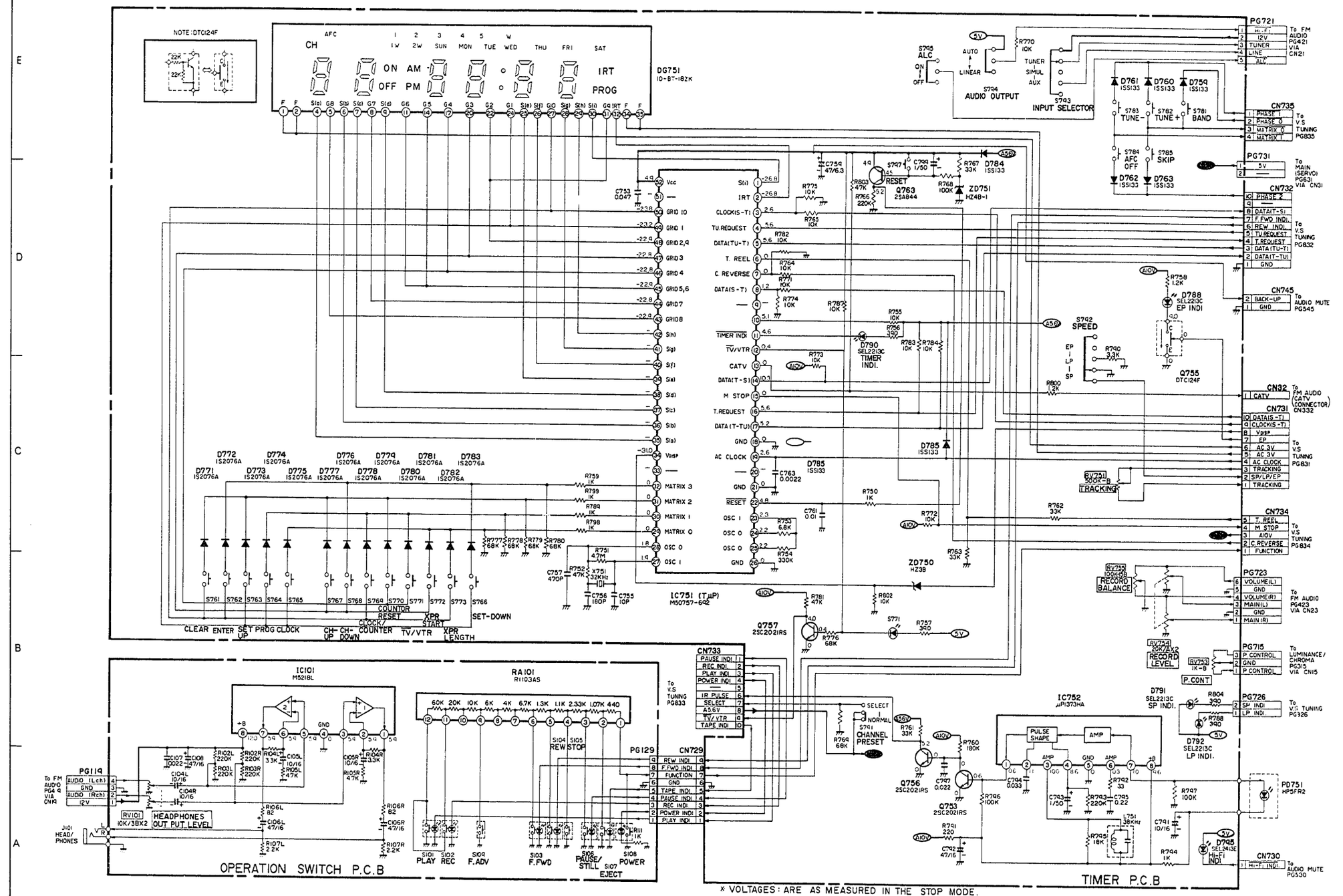


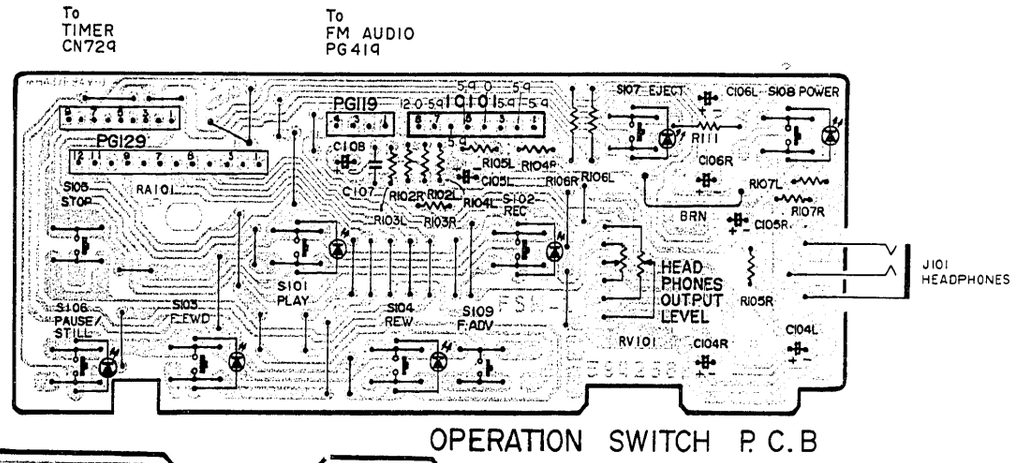
V.S TUNING P.C.B

※ VOLTAGES ARE AS MEASURED IN THE STOP MODE.

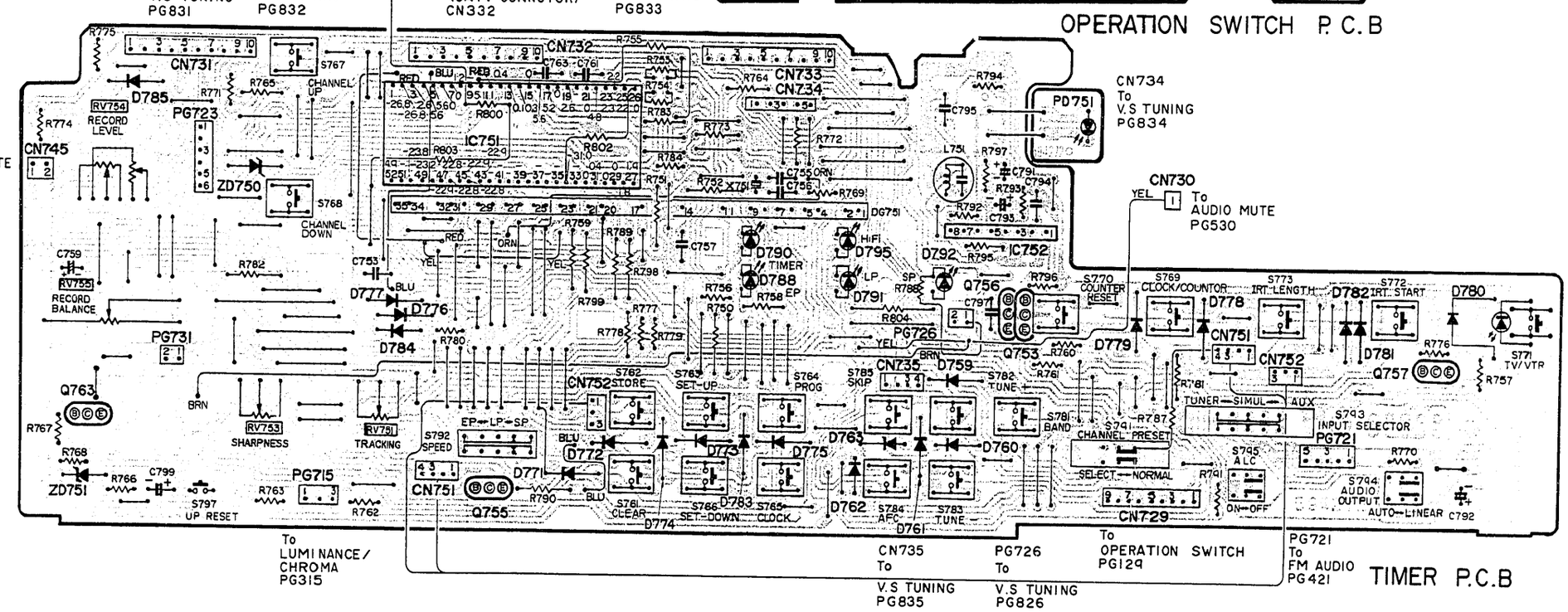

To TUNER/IF PG301
To MAIN (REAR JACK) PG536
To TIMER CN735
To TIMER CN732
To TIMER CN731
Q806
Q805
Q802
Q801
Q807
Q810
Q809
Q803
Q804
IC803
IC801
IC802
D802
D810
D808
D807
D806
D809
D801
ZD801
ZD802
ZD807
ZD808
ZD809
LE801
PG833
PG834
PG835
PG832
PG831
PG813
PG850
PG851
PG852
PG826
To TIMER CN733
To TIMER CN734
To MAIN (SYSTEM CONTROL) PG951
To TIMER CN736
CN27
To FM AUDIO (CATV CONNECTOR) CN327
To MAIN (SYSTEM CONTROL) PG952
※ VOLTAGE : STOP MODE.
V.S TUNING P.C.B
V.S TUNING 5-15 5-16 V.S TUNING

TIMER/OPERATION SWITCH



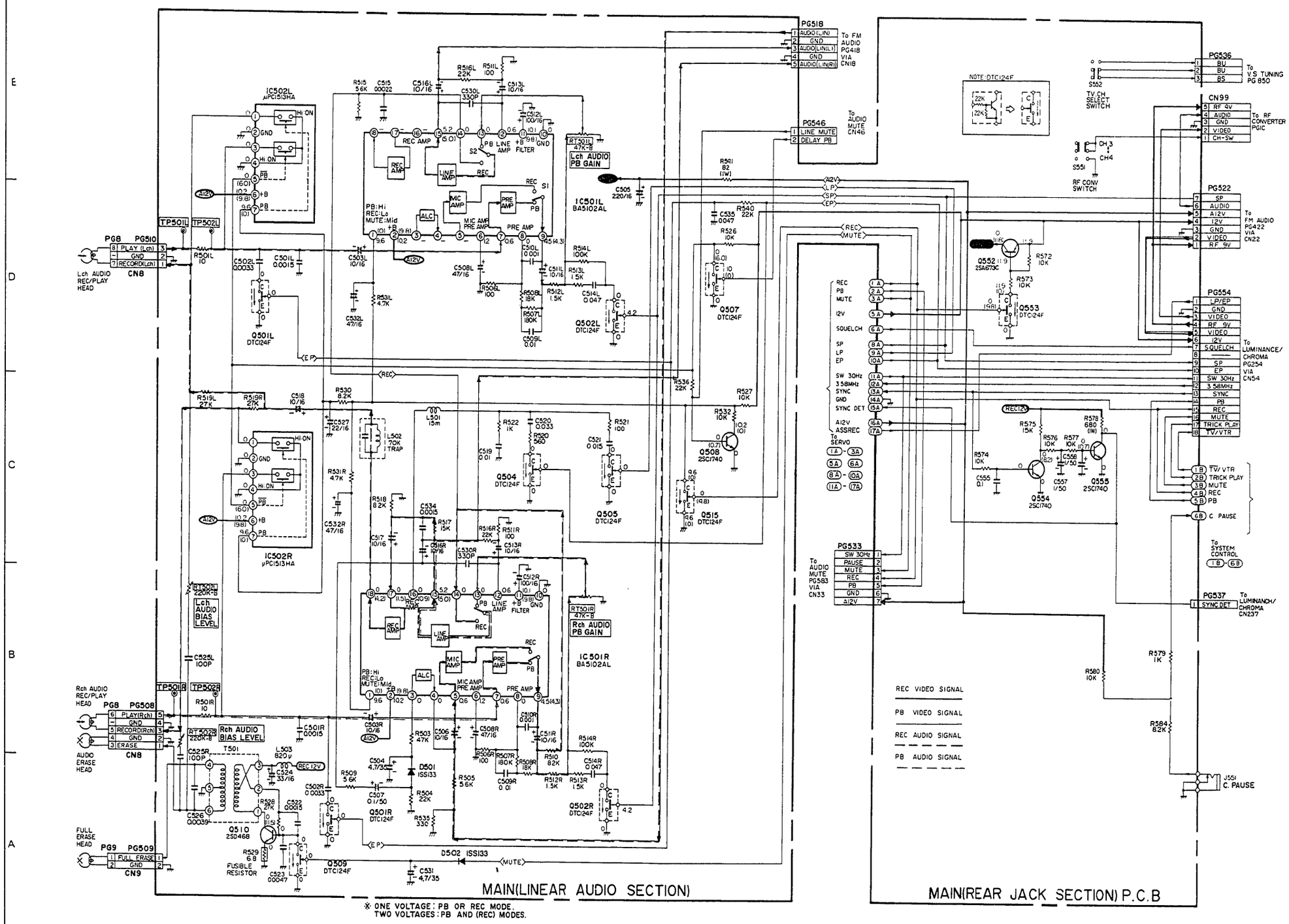


OPERATION SWITCH P.C.B

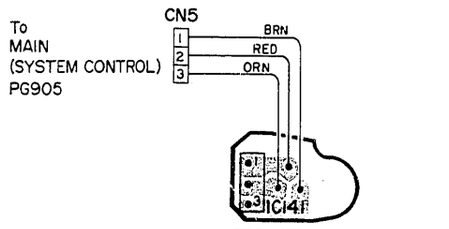


TIMER P.C.B

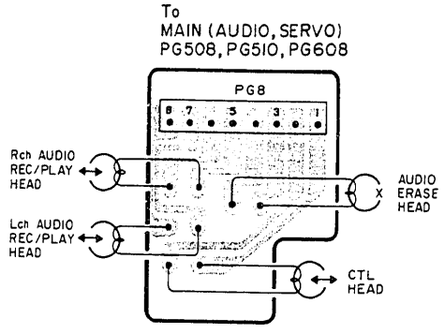
AUDIO-REAR JACK

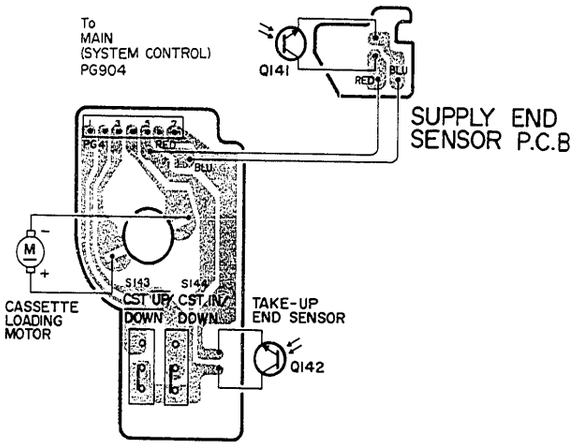


PERIPHERAL BOARD

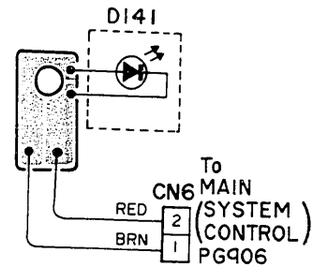


TAKE-UP REEL SENSOR P.C.B

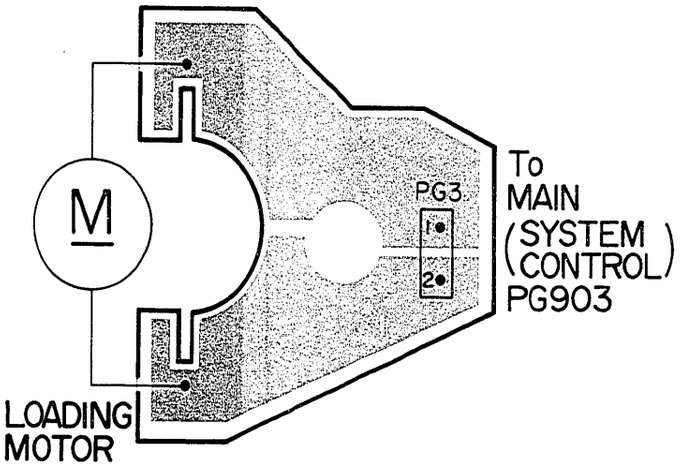




CASSETTE LOADING MOTOR P.C.B

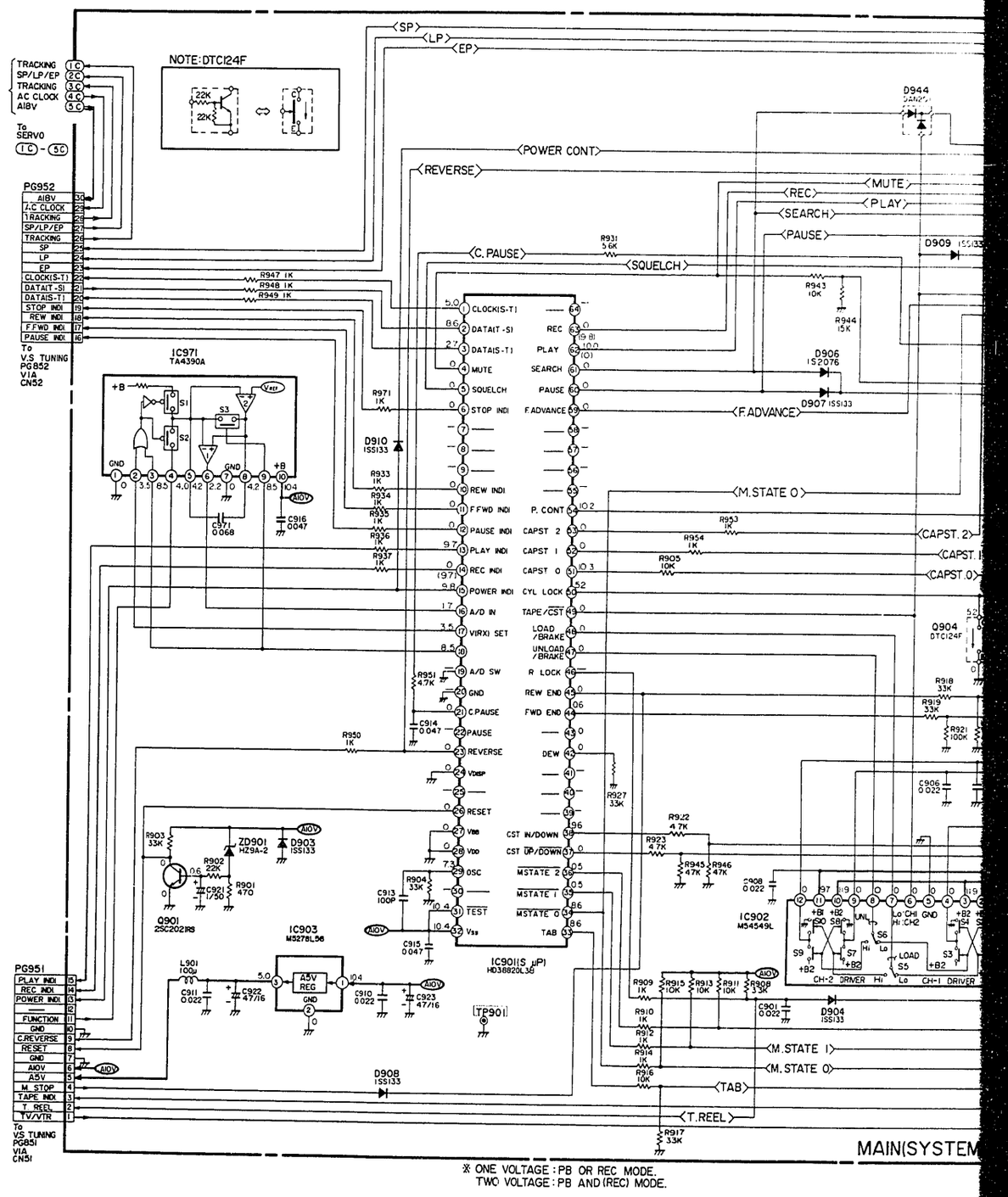


END LAMP P.C.B



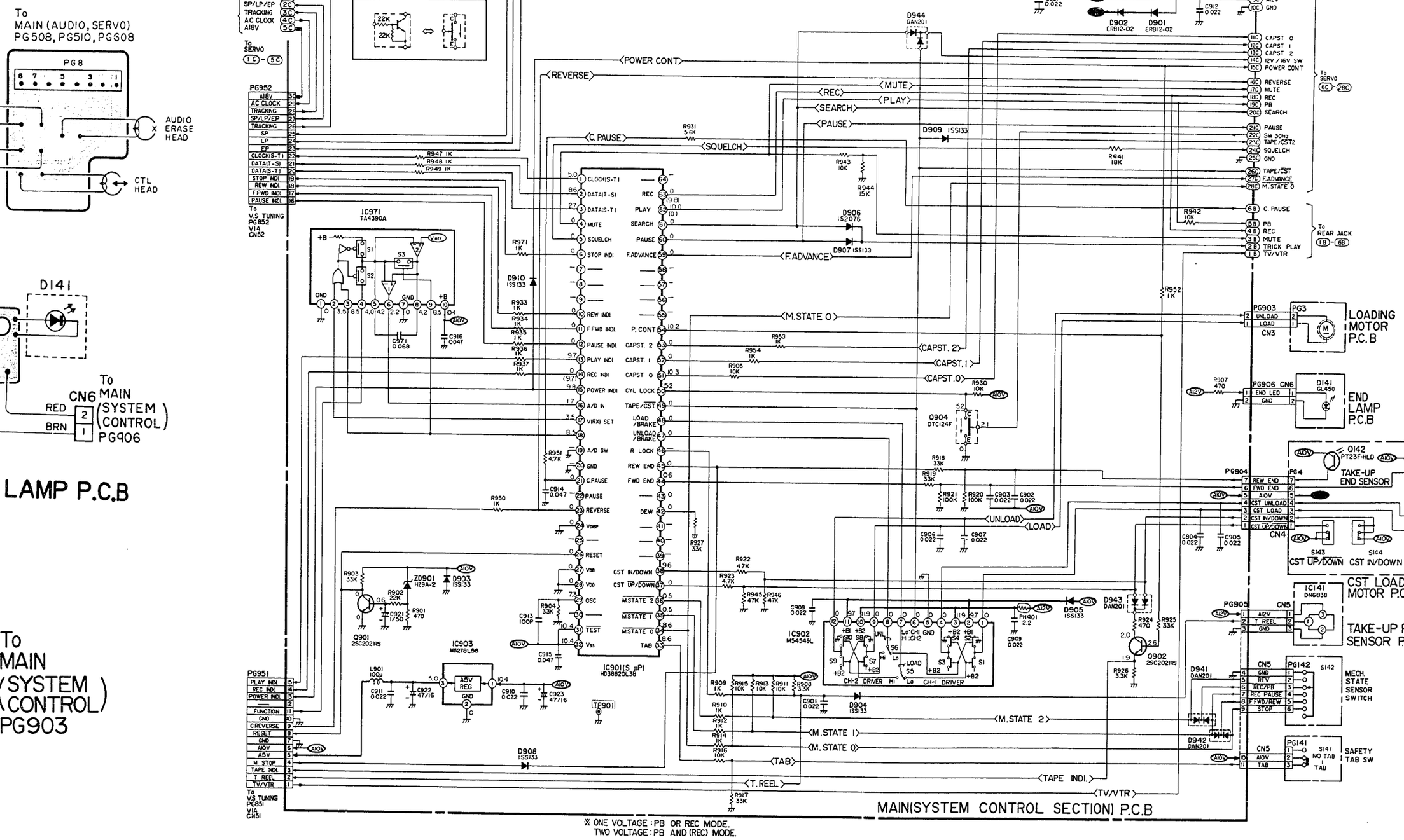
LOADING MOTOR

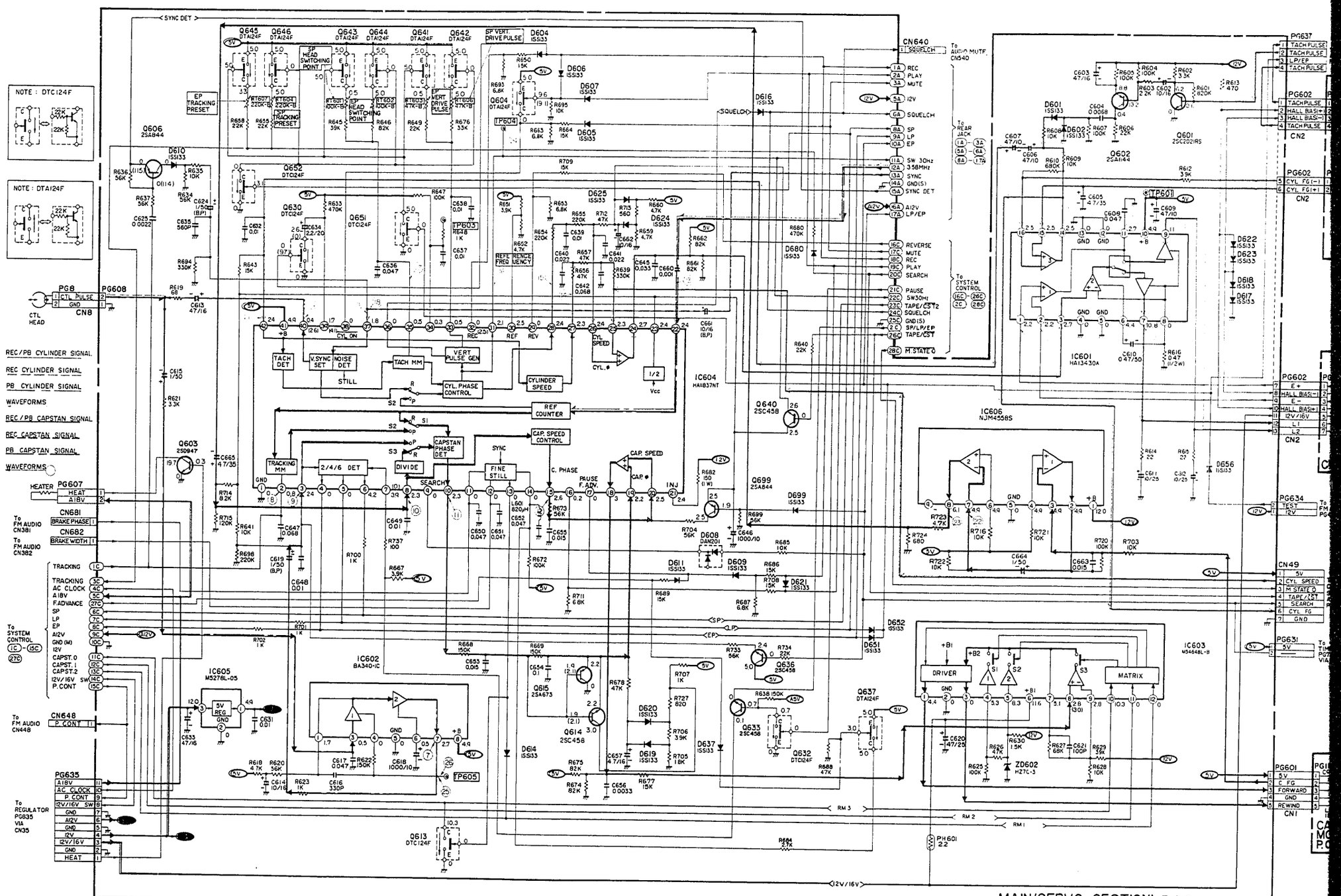
SYSTEM CONTROL

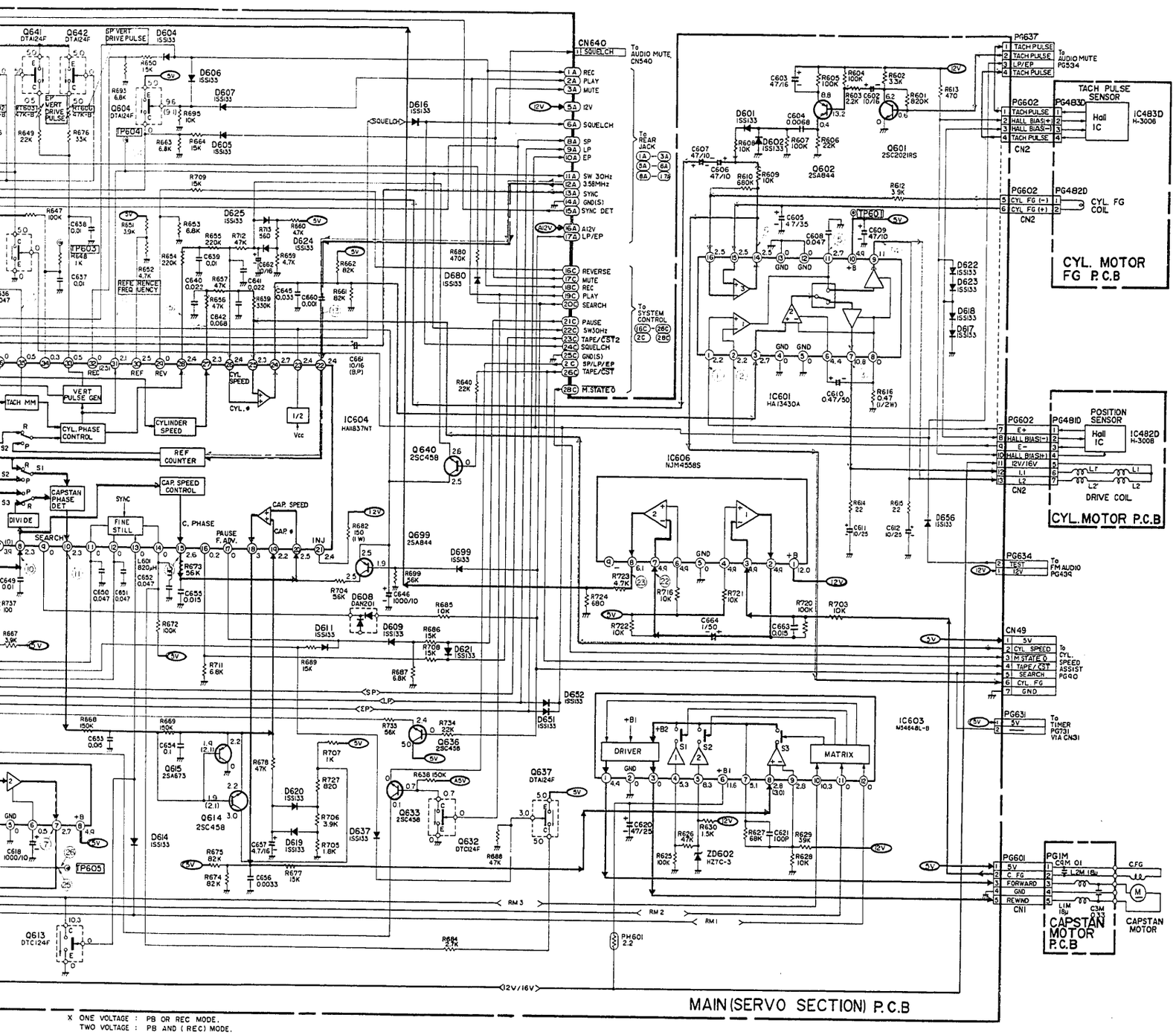


※ ONE VOLTAGE : PB OR REC MODE.
TWO VOLTAGE : PB AND (REC) MODE.

SYSTEM CONTROL




NOTE : DTC124F
NOTE : DTA124F
REC/PB CYLINDER SIGNAL
REC CYLINDER SIGNAL
PB CYLINDER SIGNAL
WAVEFORMS
REC/PB CAPSTAN SIGNAL
REC CAPSTAN SIGNAL
PB CAPSTAN SIGNAL
WAVEFORMS
SYNC DET
EP TRACKING PRESET
SP HEAD SWITCHING POINT
SP TRACKING PRESET
EP HEAD SWITCHING POINT
SP VERT DRIVE PULSE
EP VERT DRIVE PULSE
SQUELCH
REFERENCE FREQUENCY
CYL ON
REC
REF
REV
CYL SPEED
TACH DET
V.SYNC NOISE DET
TACH MM
VERT PULSE GEN
STILL
CYL. PHASE CONTROL
CYLINDER SPEED
REF COUNTER
CAPSTAN PHASE DET
CAP. SPEED CONTROL
TRACKING MM
2/4/6 DET
DIVIDE
SEARCH
FINE STILL
C. PHASE
PAUSE F.ADV.
INJ
CAP. SPEED
CAP. Φ
CTL HEAD
HEATER
To FM AUDIO CN381
To FM AUDIO CN382
To SYSTEM CONTROL
To FM AUDIO CN448
To REGULATOR PG835 VIA CN35
To AUDIO MUTE CN540
To REAR JACK
To SYSTEM CONTROL
RM 3
RM 2
RM 1
MAIN(SERVO SECTION) P.C.B
* ONE VOLTAGE : PB OR REC MODE.
TWO VOLTAGE : PB AND (REC) MODE.

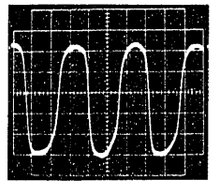


X ONE VOLTAGE : PB OR REC MODE.
TWO VOLTAGE : PB AND (REC) MODE.

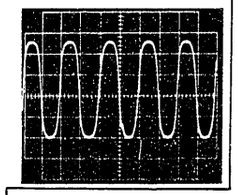
SERVO CIRCUIT WAVEFORM

[IC601]

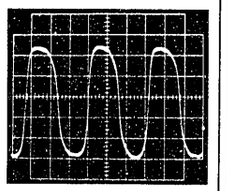
① PIN 1 REC/PB
50 mV/5 ms. div.



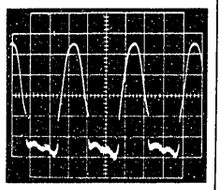
⑥ PIN 14 REC/PB
0.5V/2 ms. div.



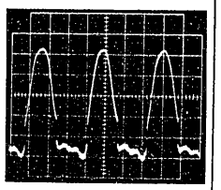
② PIN 2 REC/PB
50 mV/5 ms. div.



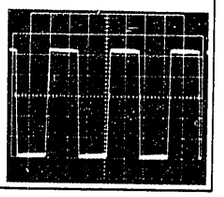
③ PIN 7 REC/PB
2V/5 ms. div.



④ PIN 9 REC/PB
2V/5 ms. div.

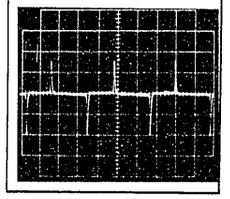


⑤ PIN 11 REC/PB
0.2V/5 ms. div.



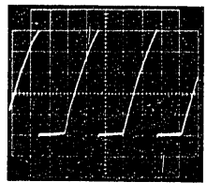
[IC602]

⑦ PIN 7 PB
1V/10 ms. div.

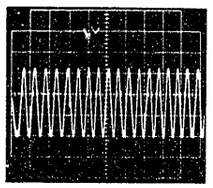


[IC604]

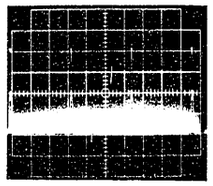
⑧ PIN 2 PB
0.5V/10 ms. div.



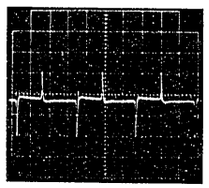
⑬ PIN 22 REC/PB
50 mV/0.5 μs. div.



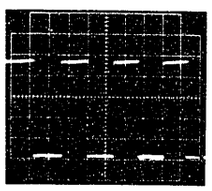
⑱ PIN 37 REC/PB
0.5V/5 ms. div.



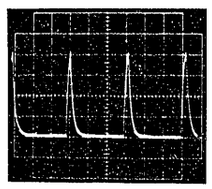
⑨ PIN 3 PB
1V/10 ms. div.



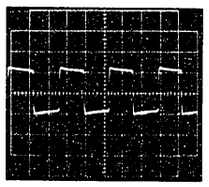
⑭ PIN 27 REC/PB
1V/0.2 ms. div.



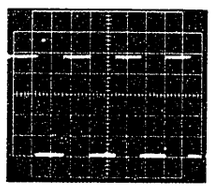
⑲ PIN 37 REC/PB
0.5V/20 μs. div.



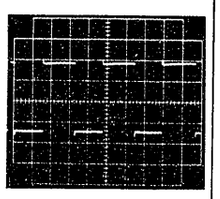
⑩ PIN 8 REC/PB
0.5V/0.5 ms. div.



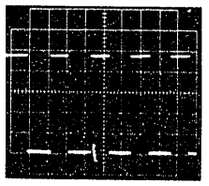
⑮ PIN 28 REC/PB
1V/0.2 ms. div.



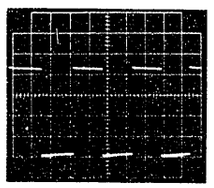
⑳ PIN 40 REC
1V/10 ms. div.



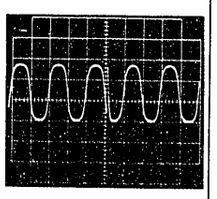
⑪ PIN 10 REC/PB
1V/0.5 ms. div.



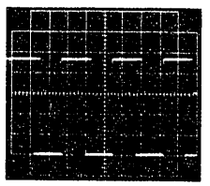
⑯ PIN 31 REC/PB
1V/10 ms. div.



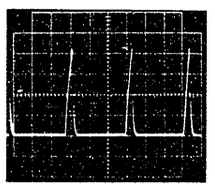
㉑ PIN 42 REC/PB
0.5V/2 ms. div.



⑫ PIN 15 REC/PB
1V/50 μs. div.

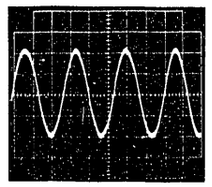


⑰ PIN 35 REC/PB
0.5V/5 ms. div.

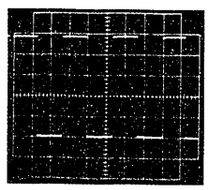


[IC606]

㉒ PIN 7 REC/PB
0.5V/2 ms. div.



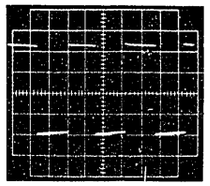
㉓ PIN 8 REC/PB
2V/5 ms. div.



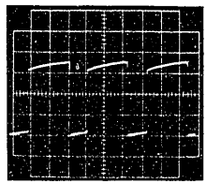
CYLINDER SPEED ASSIST CIRCUIT WAVEFORM

[TEST POINT]

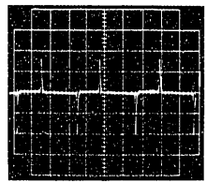
(24) TP604 REC/PB
1V/10 ms. div.



(25) TP605 REC
1V/10 ms. div.

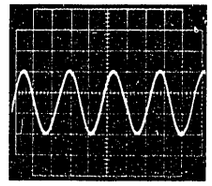


(26) TP605 PB
1V/10 ms. div.

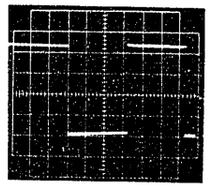


[IC99]

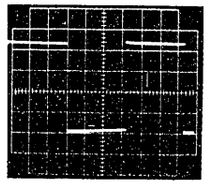
(1) PIN 5 REC/PB
50 mV/1 ms. div.



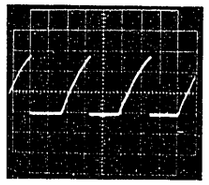
(2) PIN 6 REC/PB
1V/5 ms. div.



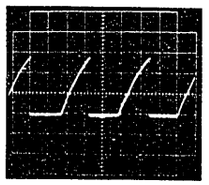
(3) PIN 11 REC/PB
1V/5 ms div.



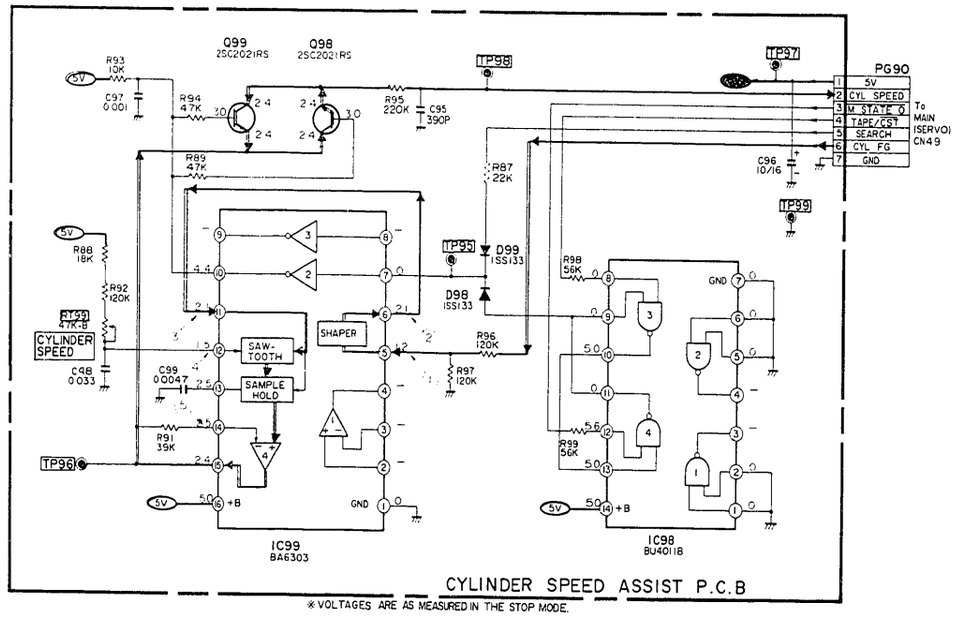
(4) PIN 12 REC/PB
1V/5 ms. div.



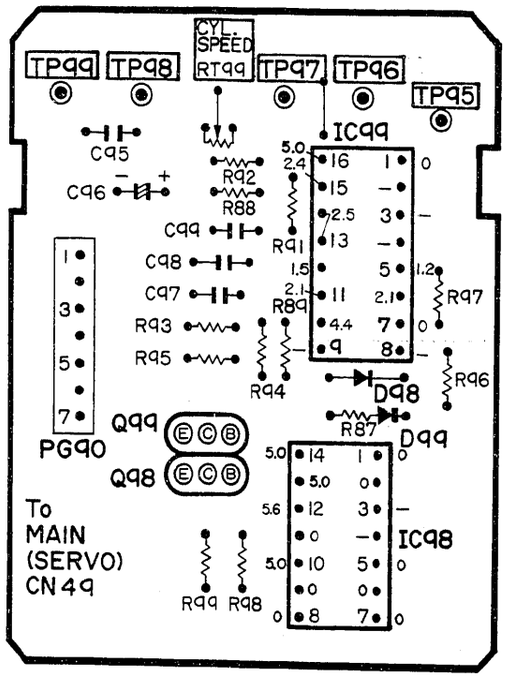
(5) PIN 14 REC/PB
1V/5 ms. div.



CYLINDER SPEED ASSIST



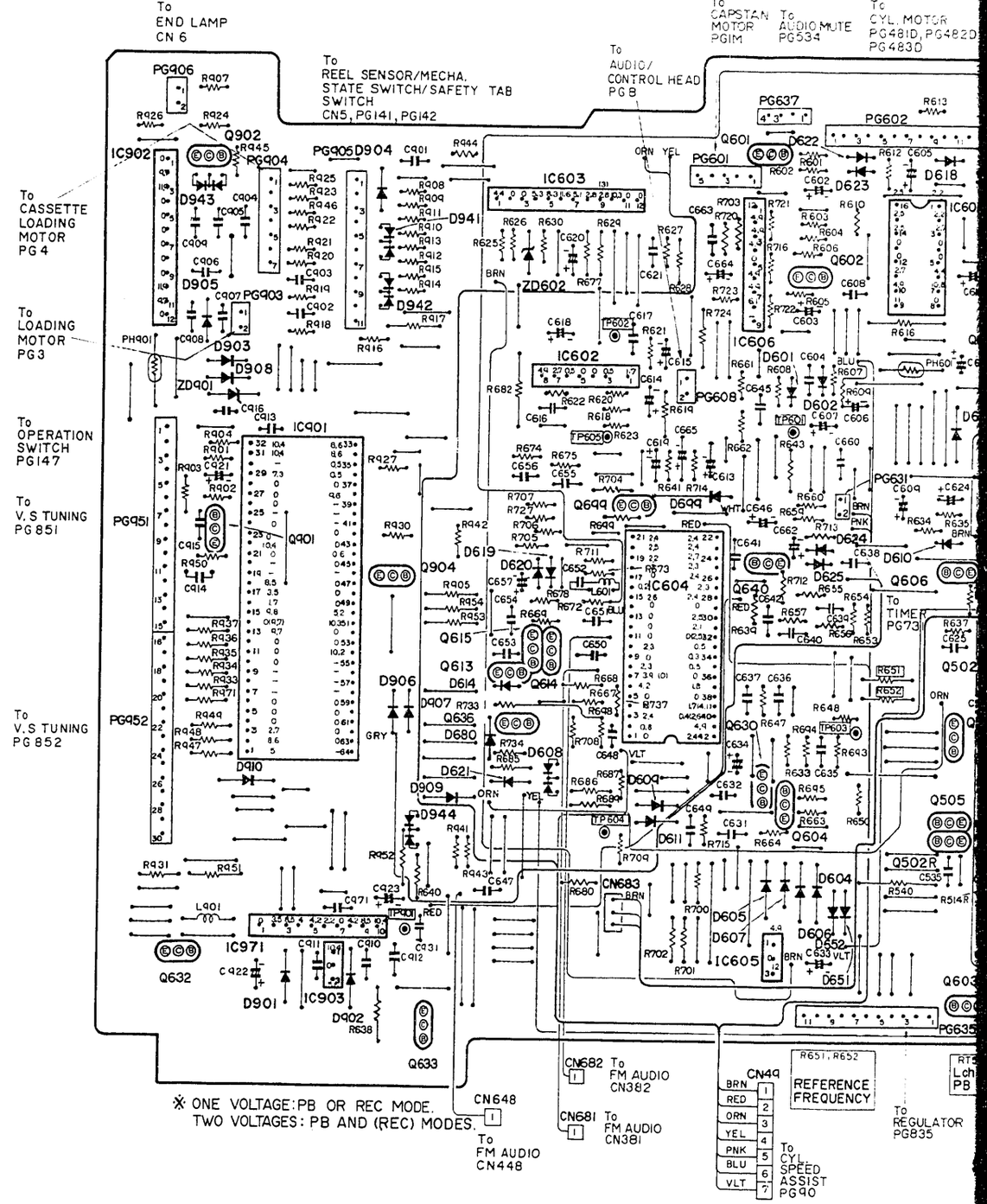
※VOLTAGES ARE AS MEASURED IN THE STOP MODE.

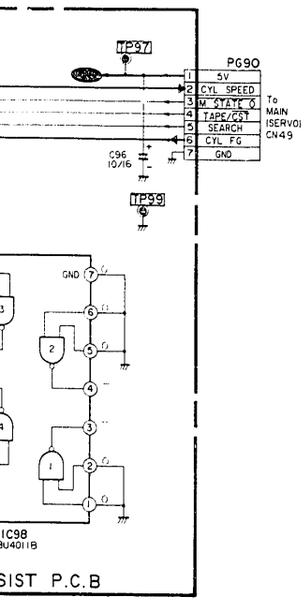


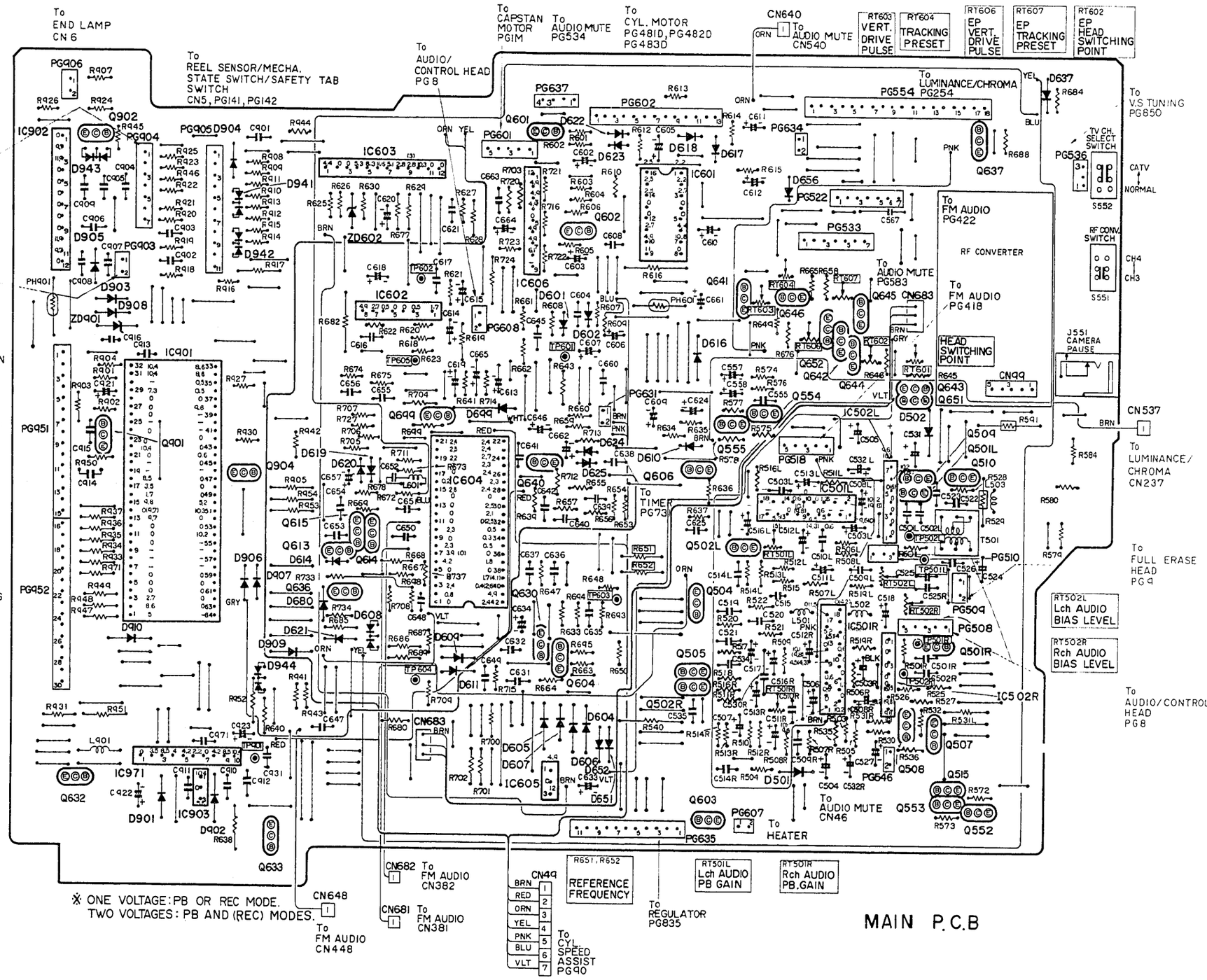
CYL. SPEED ASSIST P.C.B

※ VOLTAGE: STOP MODE

MAIN

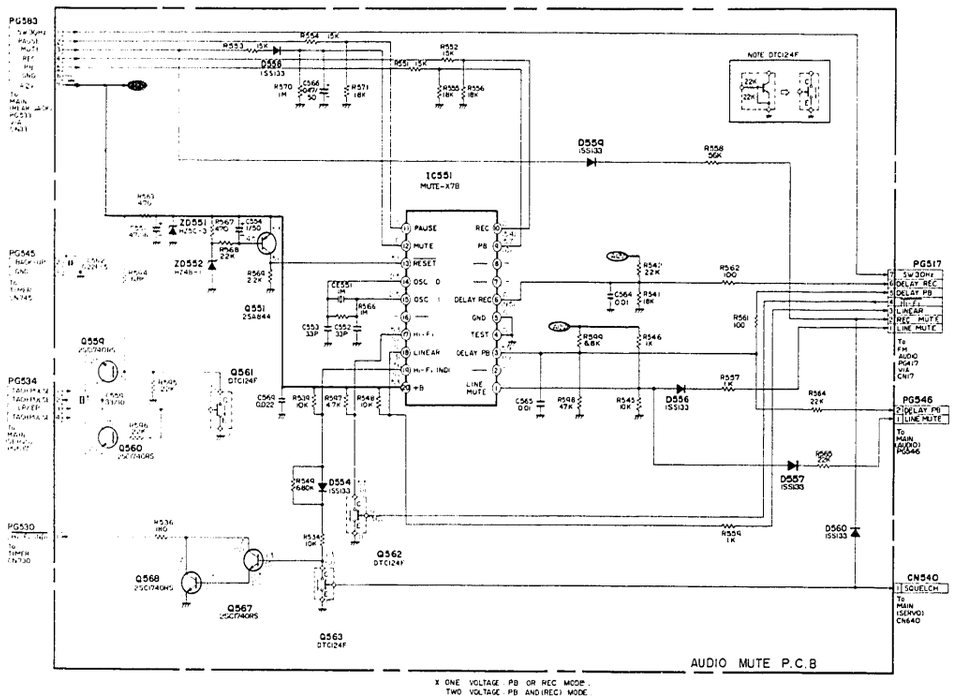


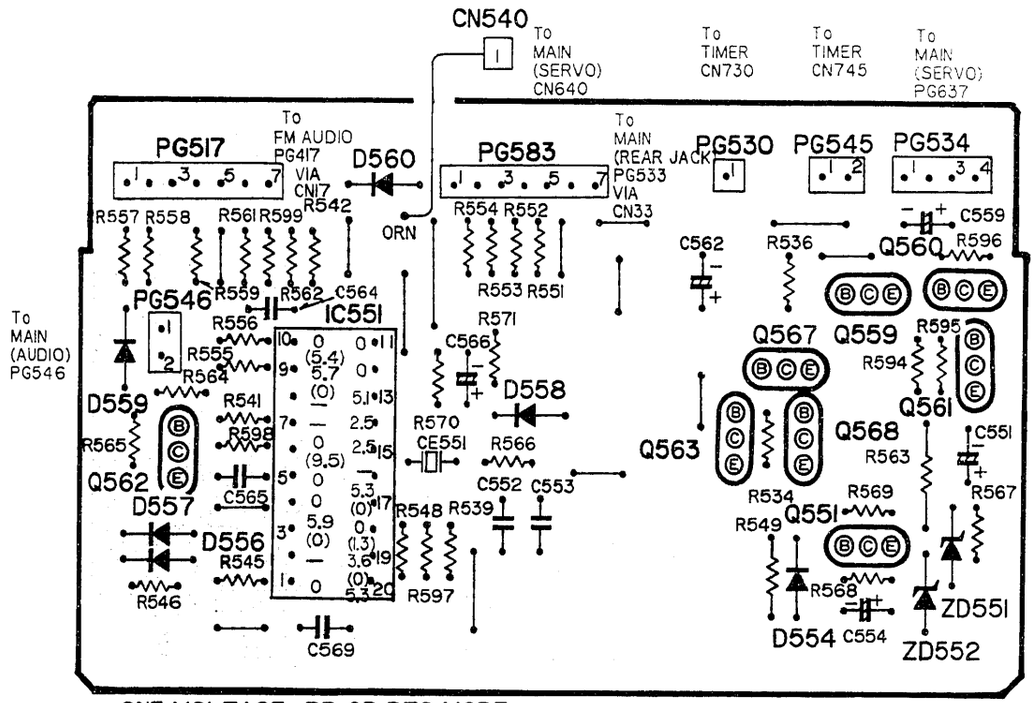

TP97
PG90
5V
CYL SPEED
M STATE Q
TAPE/CST
SEARCH
CYL FG
GND
To MAIN (SERVO) CN49
C96 10/16
TP99
GND
IC98 BU4011B
SIST P.C.B


To END LAMP CN6
To REEL SENSOR/MECHA. STATE SWITCH/SAFETY TAB SWITCH CN5, PG141, PG142
To AUDIO/ CONTROL HEAD PG8
To CAPSTAN MOTOR PGIM
To AUDIO MUTE PG534
To CYL. MOTOR PG481D, PG482D PG483D
CN640
To AUDIO MUTE CN540
RT603 VERT. DRIVE PULSE
RT604 TRACKING PRESET
RT606 EP VERT. DRIVE PULSE
RT607 EP TRACKING PRESET
RT602 EP HEAD SWITCHING POINT
To LUMINANCE/CHROMA PG554 PG254
To V.S TUNING PG850
To CASSETTE LOADING MOTOR PG4
To LOADING MOTOR PG3
To OPERATION SWITCH PG147
To V.S TUNING PG851
To V.S TUNING PG852
To FM AUDIO PG422
RF CONVERTER
To FM AUDIO PG418
To AUDIO MUTE PG583
HEAD SWITCHING POINT
TV CH. SELECT SWITCH
CATV
NORMAL
RF CONV. SWITCH
CH4
CH3
J551 CAMERA PAUSE
CN537
To LUMINANCE/ CHROMA CN237
To FULL ERASE HEAD PG9
RT502L Lch AUDIO BIAS LEVEL
RT502R Rch AUDIO BIAS LEVEL
To AUDIO/CONTROL HEAD PG8
To AUDIO MUTE CN46
To HEATER
CN682 To FM AUDIO CN382
CN681 To FM AUDIO CN381
CN648
To FM AUDIO CN448
CN49
BRN 1
RED 2
ORN 3
YEL 4
PNK 5
BLU 6
VLT 7
To CYL. SPEED ASSIST PG90
R651, R652 REFERENCE FREQUENCY
To REGULATOR PG835
RT501L Lch AUDIO PB GAIN
RT501R Rch AUDIO PB.GAIN
※ ONE VOLTAGE: PB OR REC MODE.
TWO VOLTAGES: PB AND (REC) MODES.

MAIN P.C.B

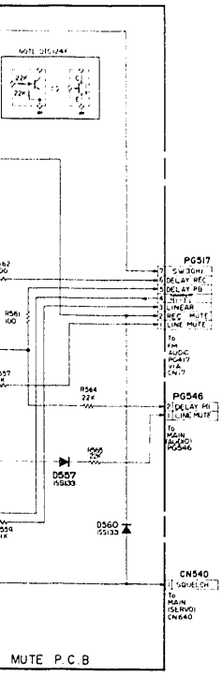
AUDIO MUTE

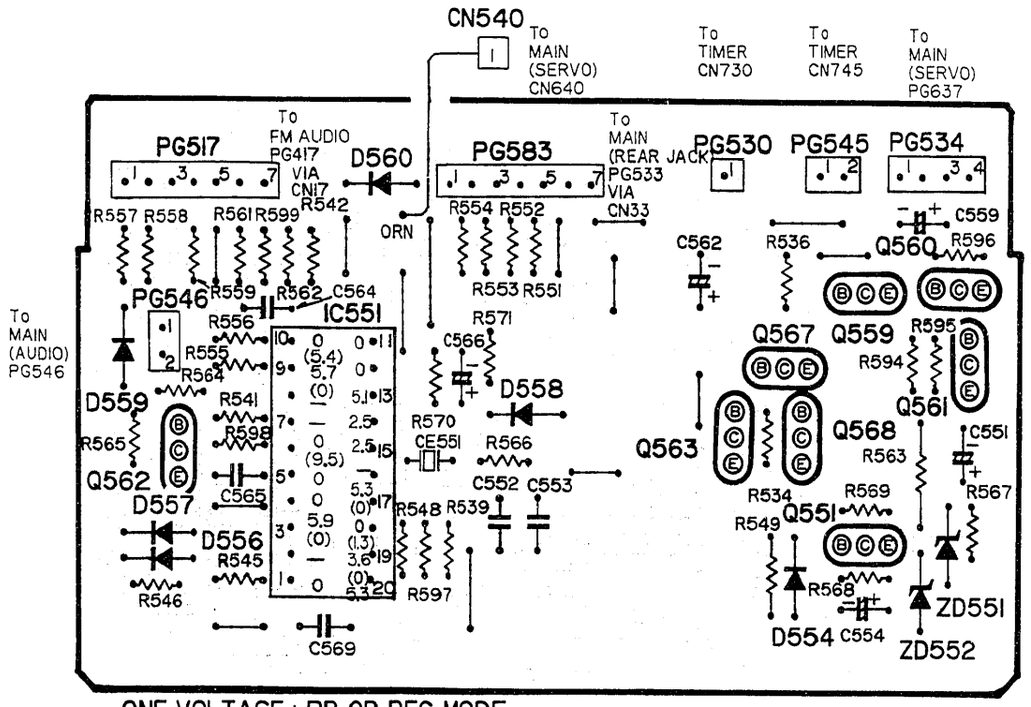




ONE VOLTAGE : PB OR REC MODE.
TWO VOLTAGE : PB AND (REC) MODE.

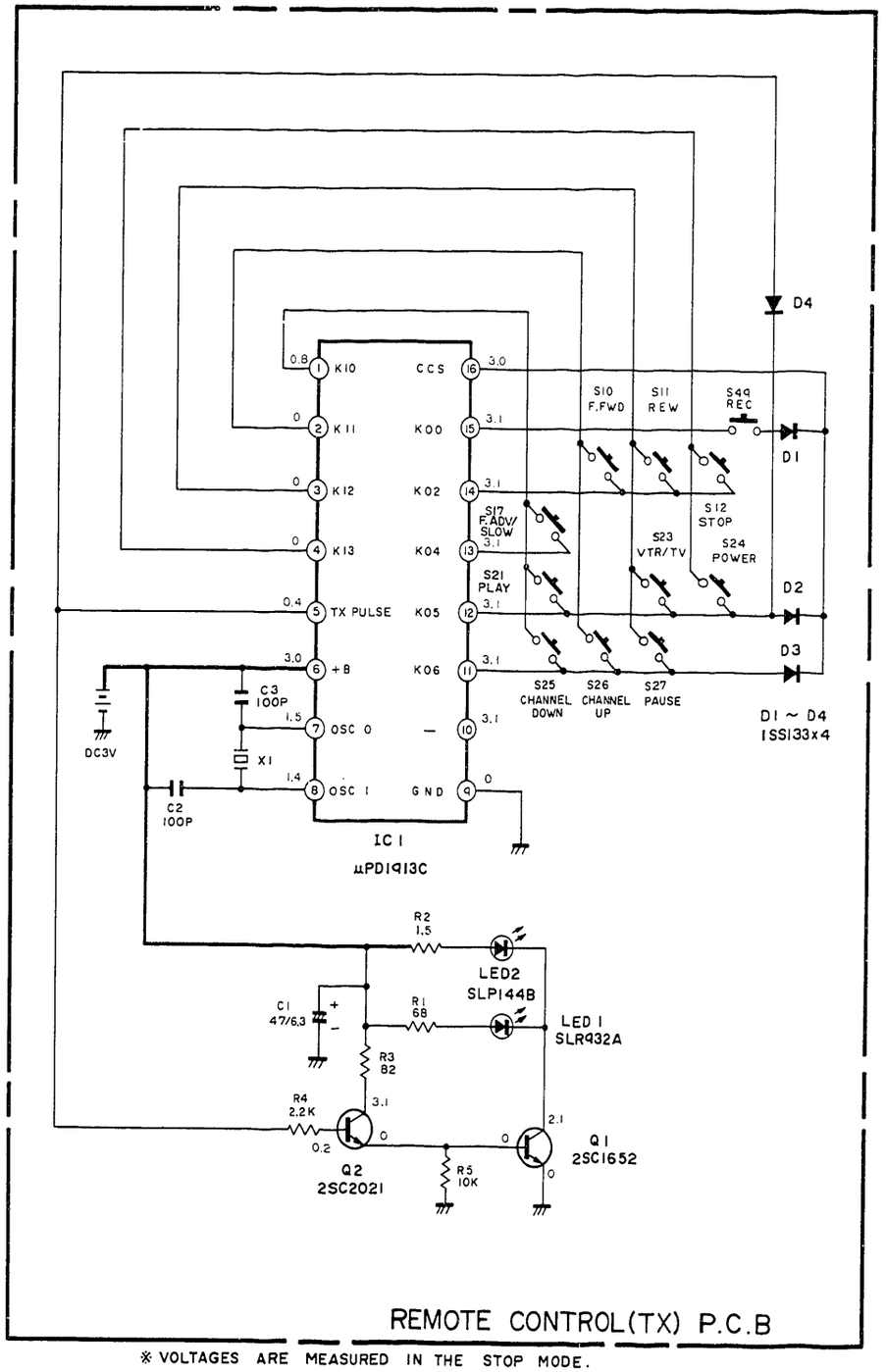
AUDIO MUTE P.C.B





ONE VOLTAGE : PB OR REC MODE.
TWO VOLTAGE : PB AND (REC) MODE.

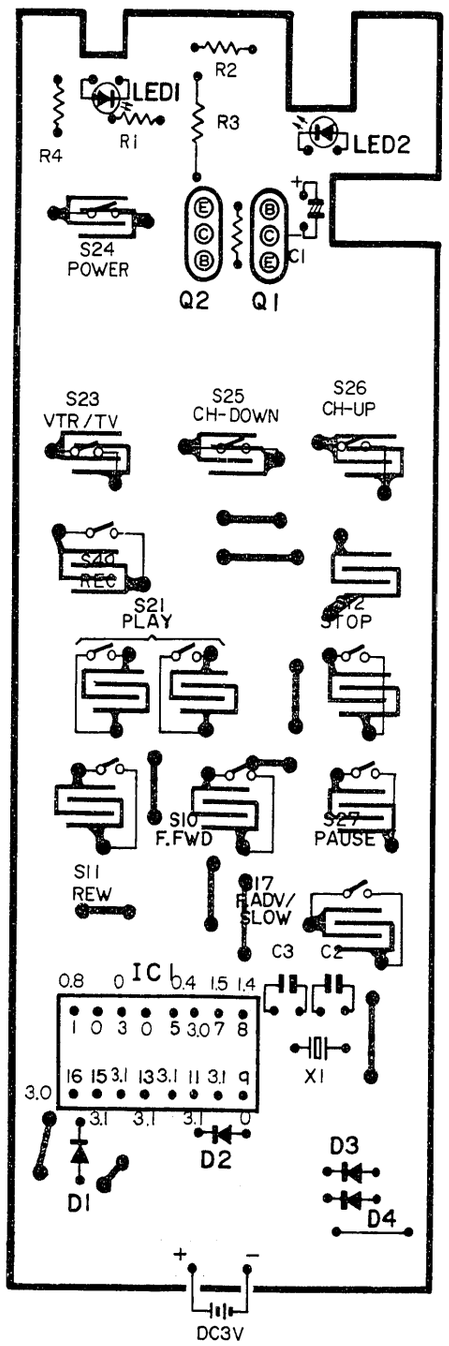
AUDIO MUTE P.C.B



REMOTE CONTROL(TX) P.C.B

※ VOLTAGES ARE MEASURED IN THE STOP MODE.

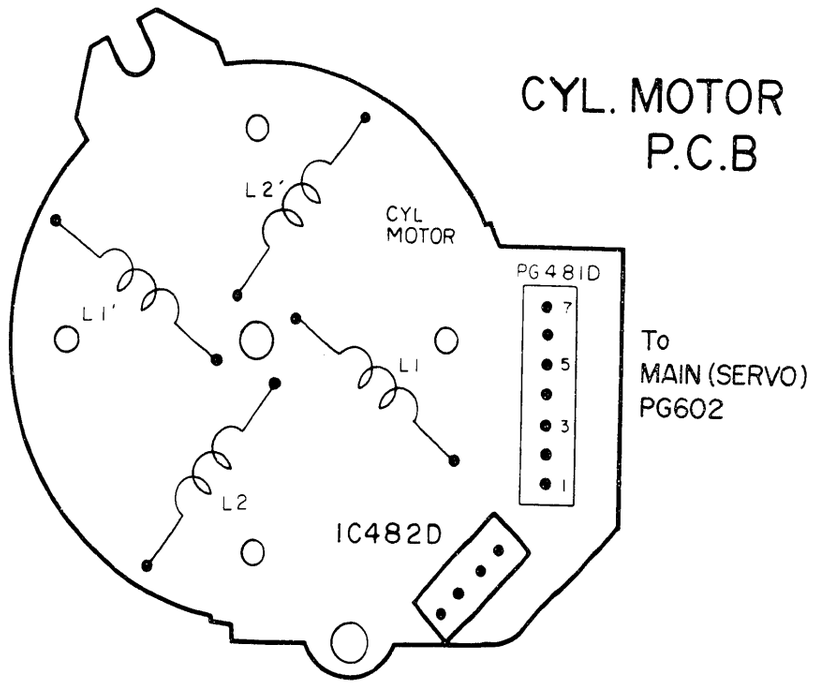
REMOTE CONTROL

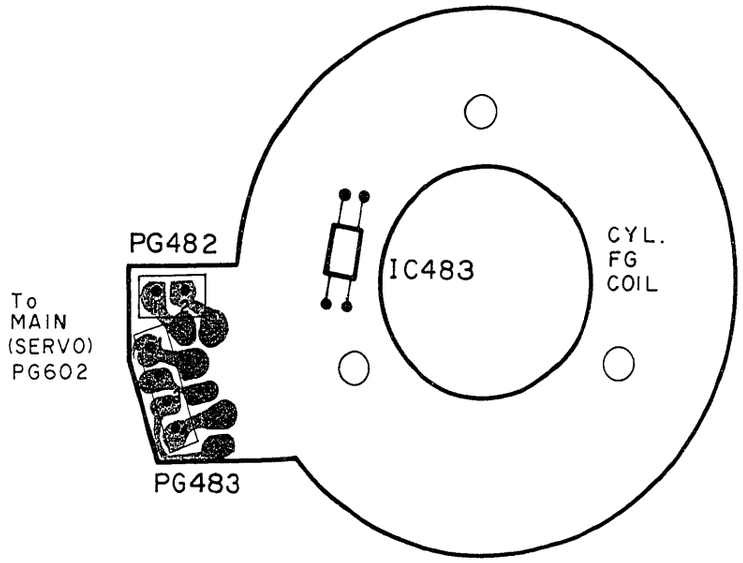


: CARBON PATTERN

REMOTE CONTROL P.C.B

CYLINDER MOTOR

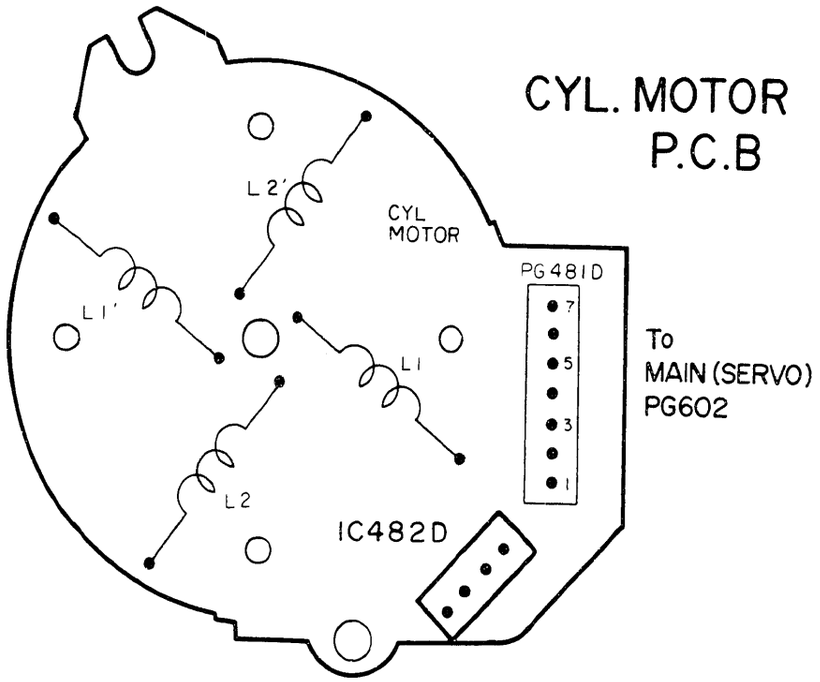




CYLINDER MOTOR FG P.C.B

CAPSTAN

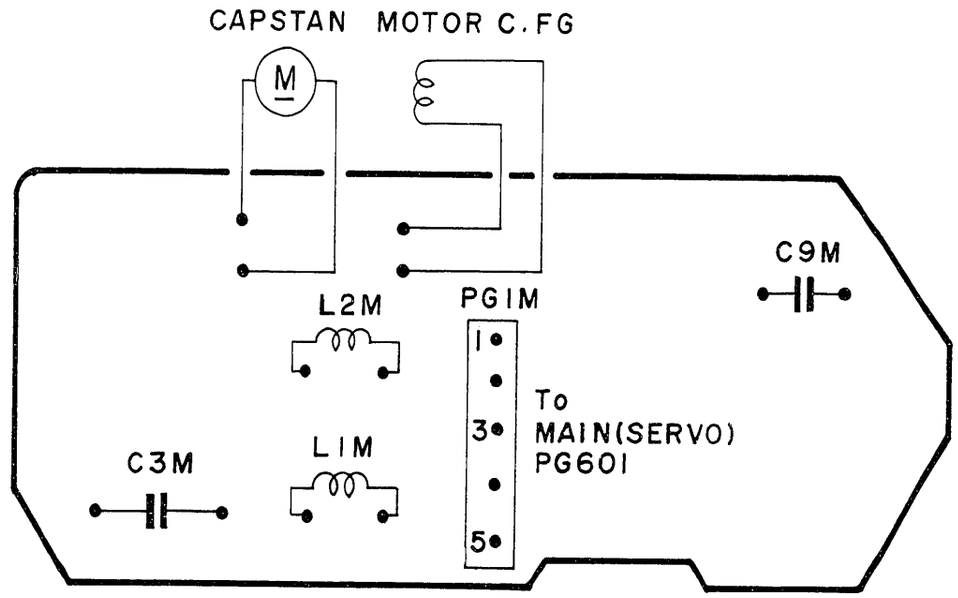
CYLINDER MOTOR



CYL. MOTOR
P.C.B

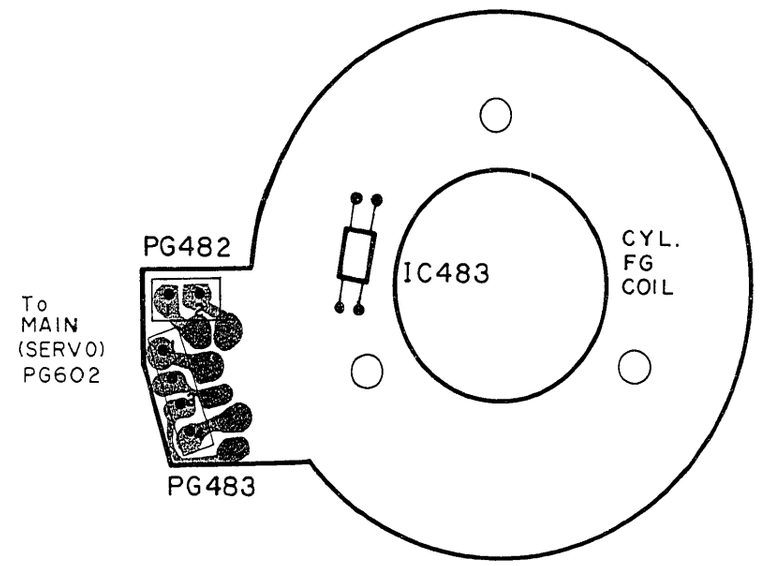
To
MAIN (SERVO)
PG602

CAPSTAN MOTOR

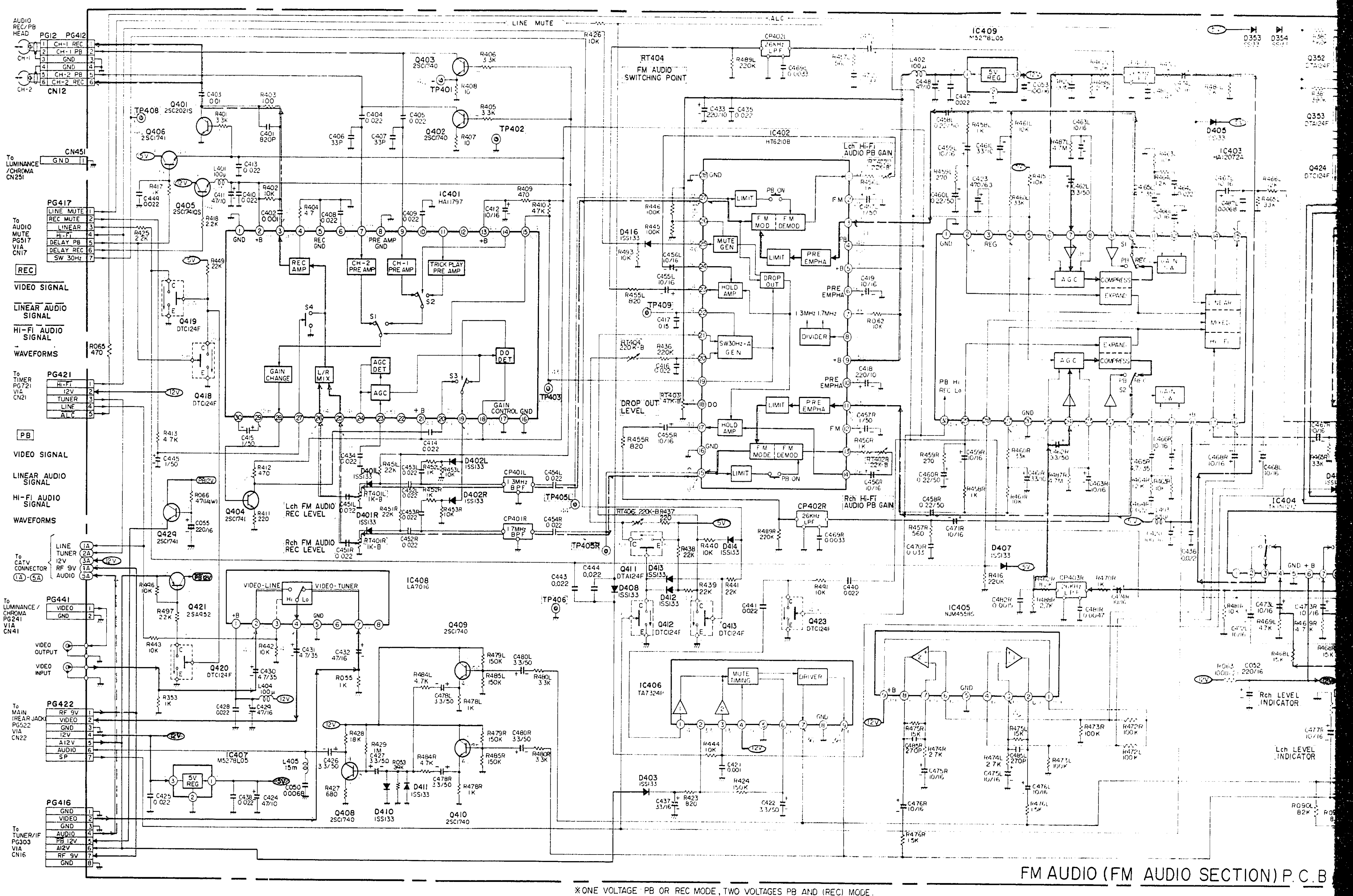


CAPSTAN MOTOR P.C.B

:CARBON PATTERN

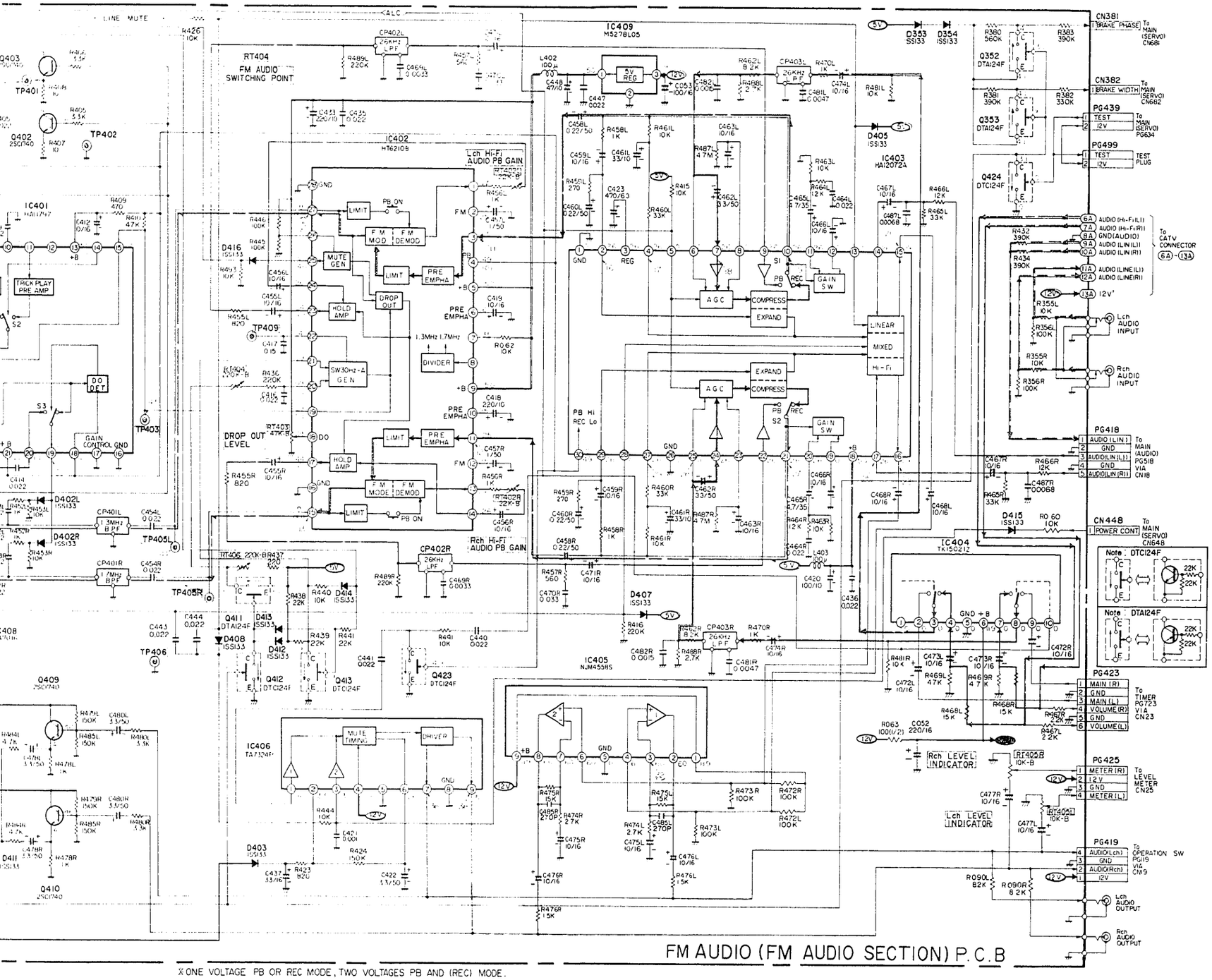


CYLINDER MOTOR FG P.C.B


AUDIO REC/PB HEAD
PG12 PG412
CH-1 REC
CH-1 PB
GND
GND
CH-2 PB
CH-2 REC
CN12
To LUMINANCE /CHROMA CN251
CN451
To AUDIO MUTE PG517 VIA CN17
PG417
LINE MUTE
REC MUTE
LINEAR
HI-FI
DELAY PB
DELAY REC
SW 30Hz
REC
VIDEO SIGNAL
LINEAR AUDIO SIGNAL
HI-FI AUDIO SIGNAL
WAVEFORMS
To TIMER PG721 VIA CN21
PG421
TUNER
LINE
ALC
PB
To CATV CONNECTOR 1A-5A
RF 9V
AUDIO
To LUMINANCE / CHROMA PG241 VIA CN41
PG441
VIDEO
VIDEO OUTPUT
VIDEO INPUT
To MAIN (REAR JACK) PG522 VIA CN22
PG422
A12V
SP
To TUNER/IF PG303 VIA CN16
PG416
PB 12V
IC401 HA11797
REC AMP
CH-2 PRE AMP
CH-1 PRE AMP
TRICK PLAY PRE AMP
GAIN CHANGE
L/R MIX
AGC DET
AGC
DO DET
GAIN CONTROL GND
Lch FM AUDIO REC LEVEL
Rch FM AUDIO REC LEVEL
CP401L 1.3MHz BPF
CP401R 1.7MHz BPF
IC408 LA7016
VIDEO-LINE
VIDEO-TUNER
IC407 M5278L05
5V REG
RT404 FM AUDIO SWITCHING POINT
IC402 HT6210B
LIMIT
PB ON
FM MOD
FM DEMOD
MUTE GEN
PRE EMPHA
DROP OUT
HOLD AMP
DIVIDER
SW30Hz-A GEN
DROP OUT LEVEL
Lch Hi-Fi AUDIO PB GAIN
Rch Hi-Fi AUDIO PB GAIN
CP402L 26KHz LPF
CP402R 26KHz LPF
IC406 TA7324P
MUTE TIMING
DRIVER
IC409 M5278L05
IC403 HA12072A
COMPRESS
EXPAND
LINEAR
MIXED
Hi-Fi
GAIN SW
PB Hi REC Lo
IC405 NJM4558S
IC404
CP403R 26KHz LPF
Rch LEVEL INDICATOR
Lch LEVEL INDICATOR

FM AUDIO (FM AUDIO SECTION) P.C.B

※ONE VOLTAGE PB OR REC MODE, TWO VOLTAGES PB AND (REC) MODE.



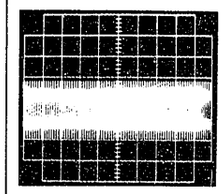
FM AUDIO (FM AUDIO SECTION) P.C.B

※ ONE VOLTAGE PB OR REC MODE, TWO VOLTAGES PB AND (REC) MODE.

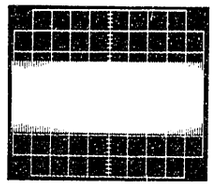
FM AUDIO CIRCUIT WAVEFORM

[IC401]

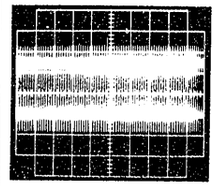
① PIN 3 REC
1V/20 μs. div.



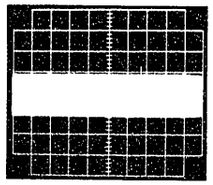
⑥ PIN 19 PB
50 mV/20 μs. div.



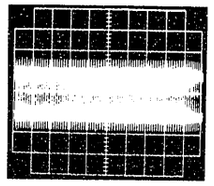
② PIN 7 REC
50 mV/20 μs. div.



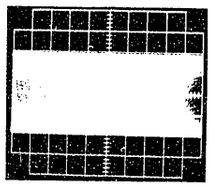
⑦ PIN 20 PB
50 mV/20 μs. div.



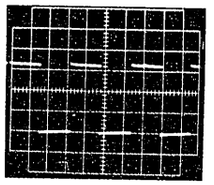
③ PIN 9 REC
50 mV/20 μs. div.



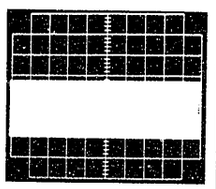
⑧ PIN 25 REC
0.1V/20 μs. div.



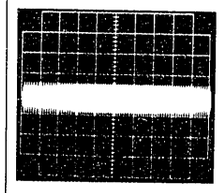
④ PIN 15 PB
0.5V/10 ms. div.



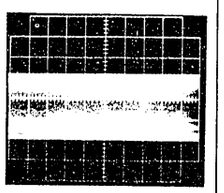
⑨ PIN 26 PB
50 mV/20 μs. div.



⑤ PIN 19 REC
50 mV/20 μs. div.



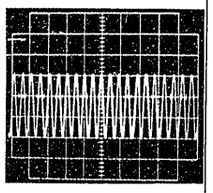
⑩ PIN 29 REC
0.2V/20 μs. div.



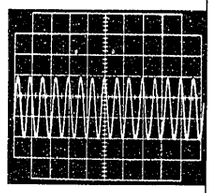
[IC402]

[IC403]

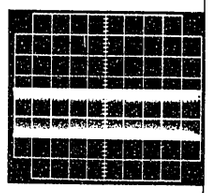
(11) PIN 3 REC
0.2V/5 ms. div.



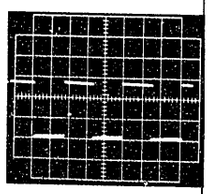
(12) PIN 11 REC
0.2V/5 ms. div.



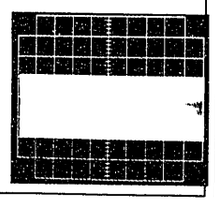
(13) PIN 15 REC
50 mV/20 μs. div.



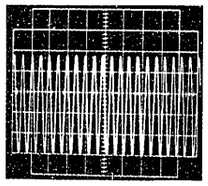
(14) PIN 19 PB
0.5V/10 ms. div.



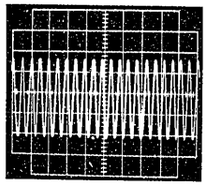
(15) PIN 27 REC
0.5V/20 μs. div.



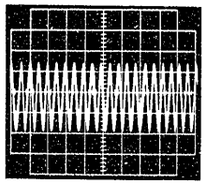
(16) PIN 2 REC
0.1V/5 ms. div.



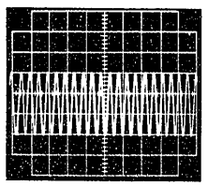
(17) PIN 4 REC
50 mV/5 ms. div.



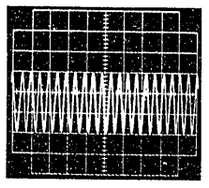
(18) PIN 7 REC
10 mV/5 ms. div.



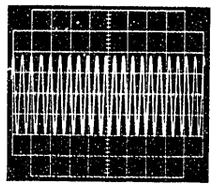
(19) PIN 10 REC/PB
0.2V/5 ms. div.



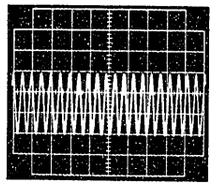
(20) PIN 14 REC/PB
0.1V/5 ms. div.



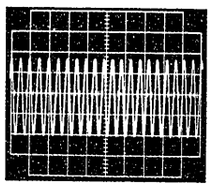
(21) PIN 15 REC
50 mV/5 ms. div.



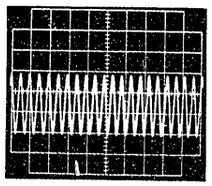
(22) PIN 15 PB
0.1V/5 ms. div.



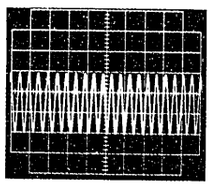
(23) PIN 16 REC
50 mV/5 ms. div.



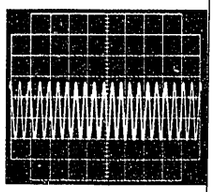
(24) PIN 16 PB
0.1V/5 ms. div.



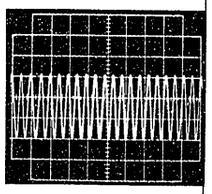
(25) PIN 17 REC
0.1V/5 ms. div.



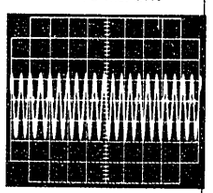
(26) PIN 17 PB
0.1V/5 ms. div.



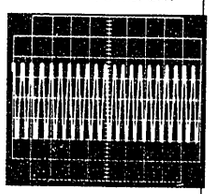
(27) PIN 21 REC/PB
0.2V/5 ms. div.



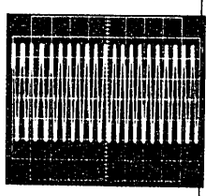
(28) PIN 25 REC
0.1V/5 ms. div.



(29) PIN 27 REC/PB
50 mV/5 ms. div.

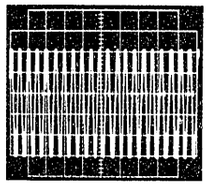


(30) PIN 29 REC/PB
0.1V/5 ms. div.

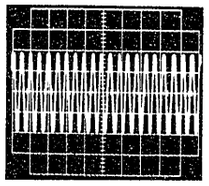


[IC405]

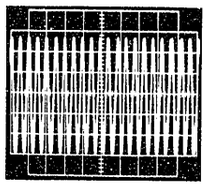
(31) PIN 2 REC/PB
0.2V/5 ms. div.



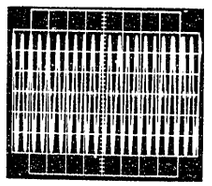
(32) PIN 3 REC
50 mV/5 ms. div.



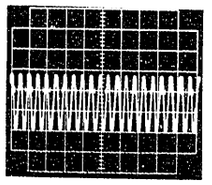
(33) PIN 4 PB
50 mV/5 ms. div.



(34) PIN 6 PB
50 mV/5 ms. div.

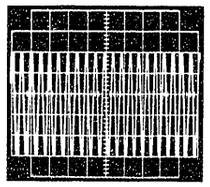


(35) PIN 8 PB
0.5V/5 ms. div.

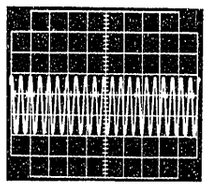


[IC406]

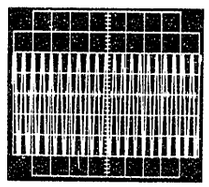
(36) PIN 7 REC
0.2V/5 ms. div.



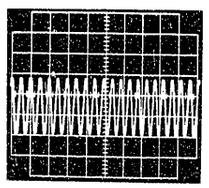
(37) PIN 7 PB
0.5V/5 ms. div.



(38) PIN 9 REC
0.2V/5 ms. div.

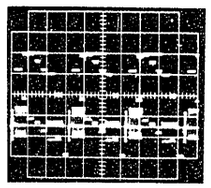


(39) PIN 9 PB
0.5V/5 ms. div.

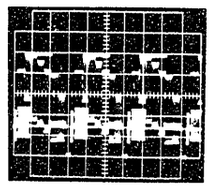


[IC408]

(40) PIN 2 REC/PB
0.2V/20 μs. div.

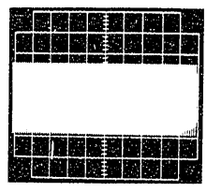


(41) PIN 4 REC/PB
0.2V/20 μs. div.

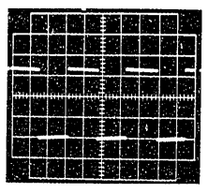


[TEST POINT]

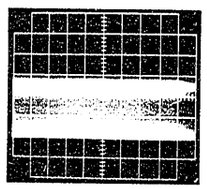
(42) TP401 REC
50 mV/20 μs. div.



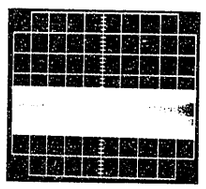
(43) TP403 PB
0.5V/10 ms. div.



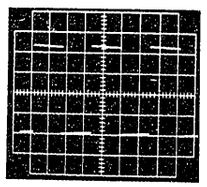
(44) TP405L REC
0.5V/20 μs. div.



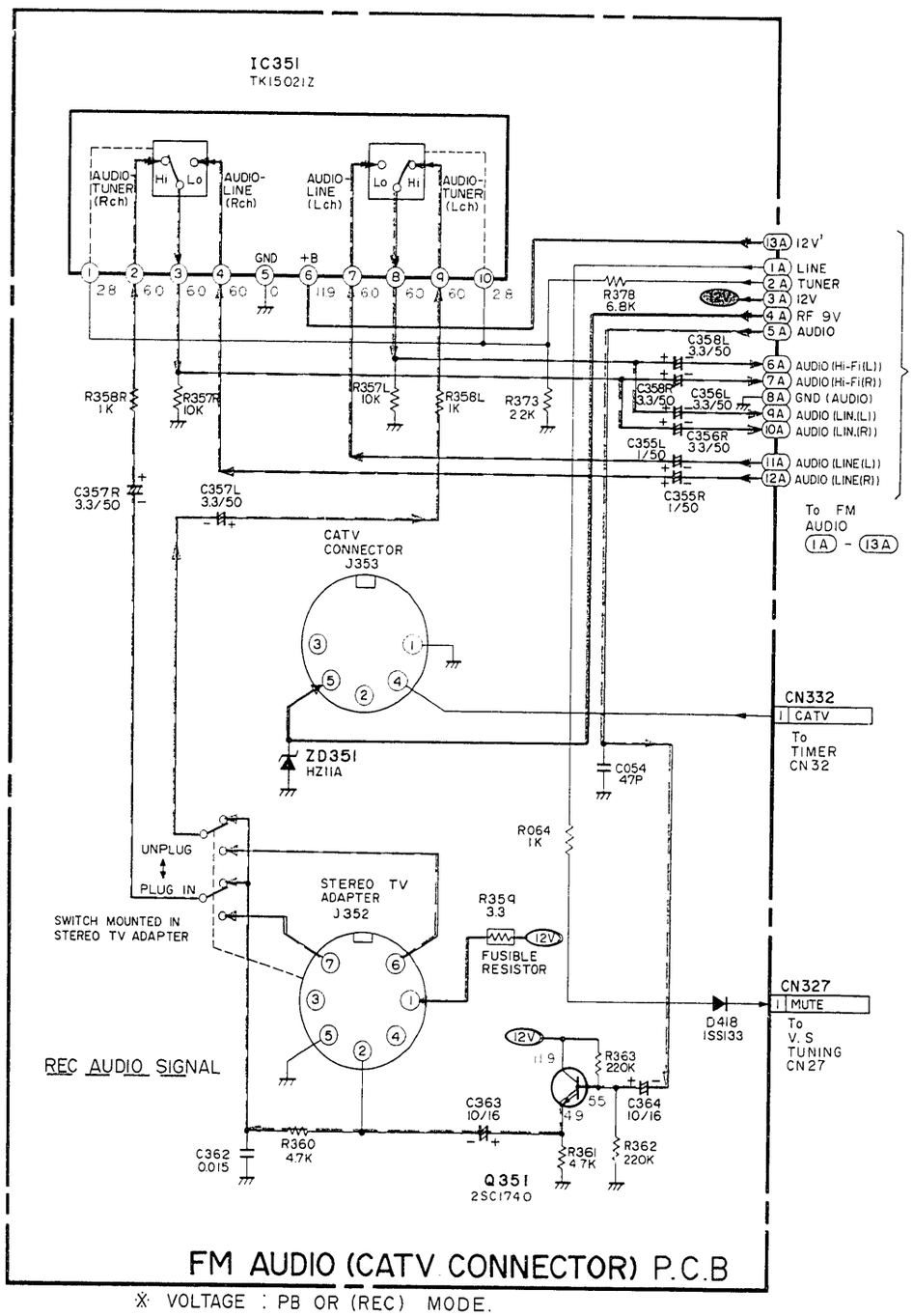
(45) TP405R REC
0.5V/20 μs. div.



(46) TP408 REC
1V/10 ms. div.

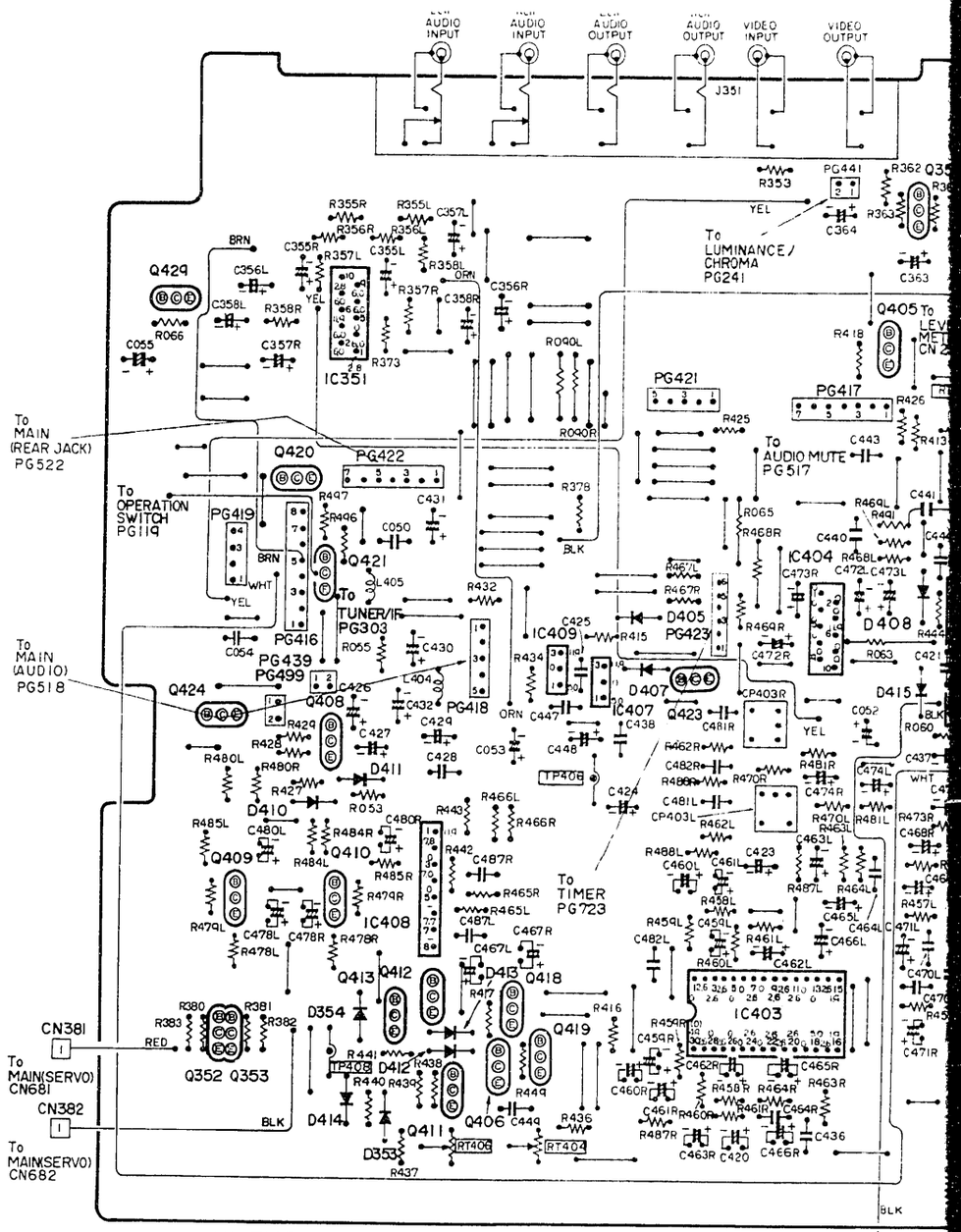


CATV CONNECTOR



FM AUDIO (CATV CONNECTOR) P.C.B

※ VOLTAGE : PB OR (REC) MODE.

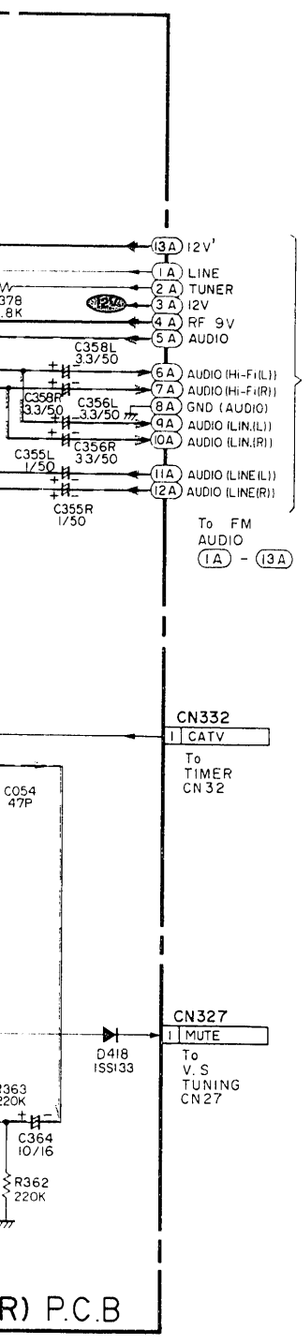


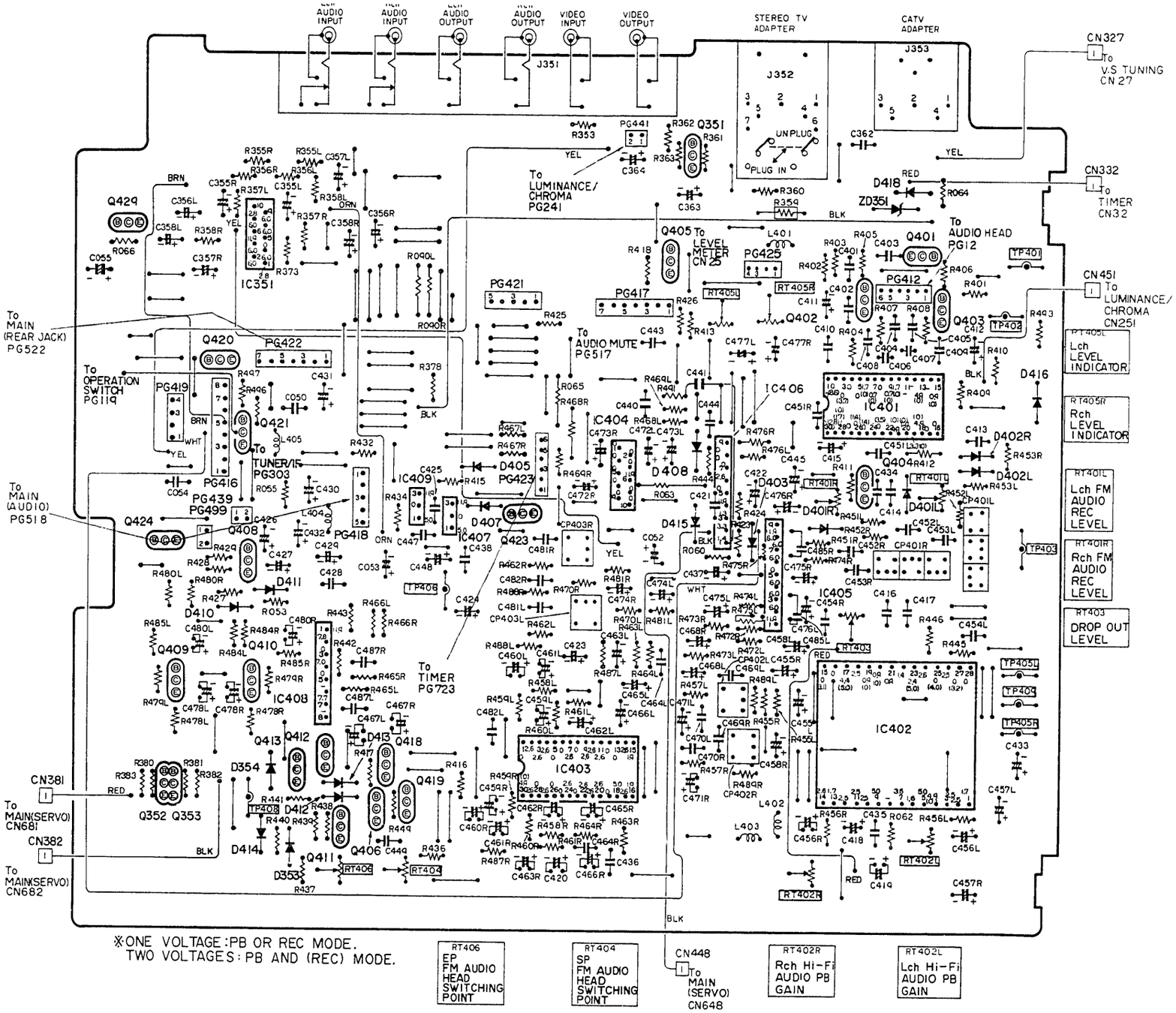
※ONE VOLTAGE:PB OR REC MODE.
TWO VOLTAGES: PB AND (REC) MODE.

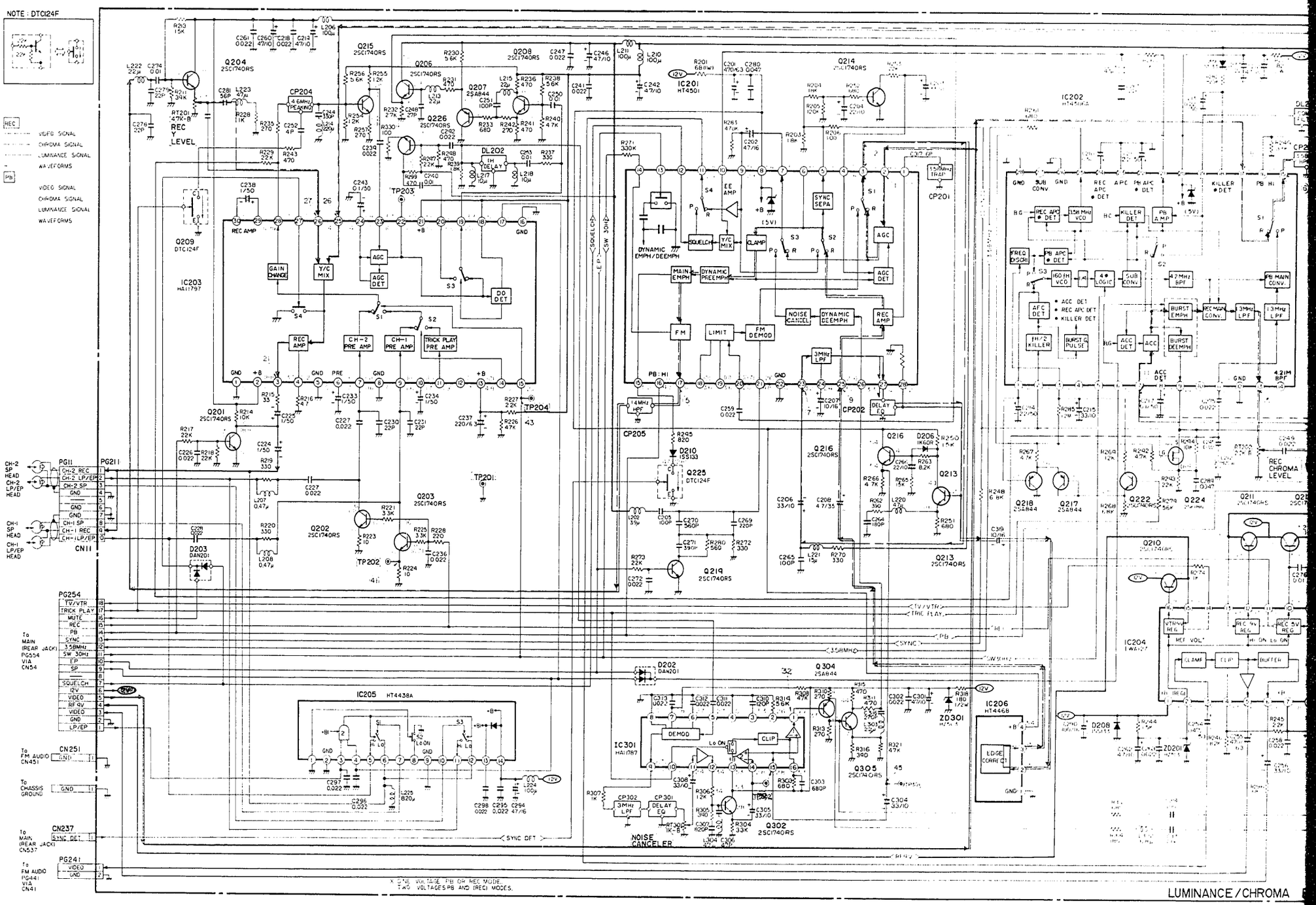
RT406
EP
FM AUDIO
HEAD
SWITCHING
POINT

RT404
SP
FM AUDIO
HEAD
SWITCHING
POINT

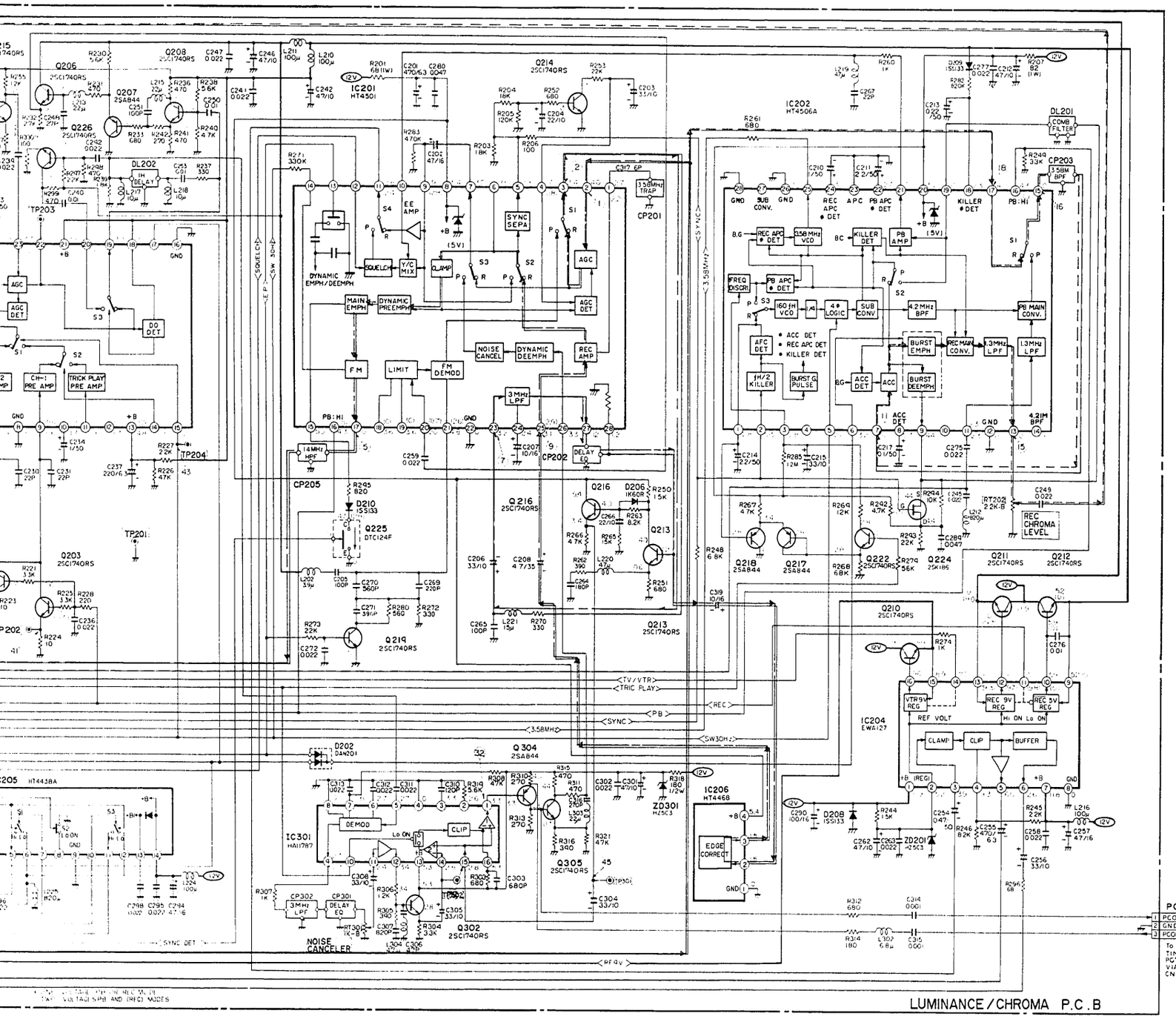
CN448
To MAIN (SERV CN64


13A 12V'
1A LINE
2A TUNER
3A 12V
4A RF 9V
5A AUDIO
6A AUDIO (Hi-Fi(L))
7A AUDIO (Hi-Fi(R))
8A GND (AUDIO)
9A AUDIO (LIN.(L))
10A AUDIO (LIN.(R))
11A AUDIO (LINE(L))
12A AUDIO (LINE(R))
C358L 3.3/50
C358R 3.3/50
C356L 3.3/50
C356R 33/50
C355L 1/50
C355R 1/50
To FM AUDIO 1A - 13A
CN332
CATV
To TIMER CN32
CN327
MUTE
To V.S TUNING CN27
D418 ISS133
C364 10/16
R362 220K
R) P.C.B


L-ch AUDIO INPUT
R-ch AUDIO INPUT
L-ch AUDIO OUTPUT
R-ch AUDIO OUTPUT
VIDEO INPUT
VIDEO OUTPUT
J351
STEREO TV ADAPTER
J352
UNPLUG
PLUG IN
CATV ADAPTER
J353
CN327 To V.S TUNING CN27
CN332 To TIMER CN32
CN451 To LUMINANCE/CHROMA CN251
To LUMINANCE/CHROMA PG241
To AUDIO HEAD PG12
To LEVEL METER CN25
To AUDIO MUTE PG517
To MAIN (REAR JACK) PG522
To OPERATION SWITCH PG119
To TUNER/IF PG303
To MAIN (AUDIO) PG518
To TIMER PG723
To MAIN(SERVO) CN681
To MAIN(SERVO) CN682
CN381
CN382
CN448 To MAIN (SERVO) CN648
IC351
IC401
IC402
IC403
IC404
IC405
IC406
IC407
IC408
IC409
Q351
Q352 Q353
Q401
Q402
Q403
Q404
Q405
Q406
Q407
Q408
Q409
Q410
Q411
Q412
Q413
Q414
Q418
Q419
Q420
Q421
Q423
Q424
Q429
D354
D405
D407
D408
D410
D411
D414
D415
D416
D418
D353
D402R
D402L
ZD351
PG417
PG419
PG421
PG422
PG423
PG425
PG439
PG499
PG441
PG412
PG416
PG418
TP401
TP402
TP403
TP404
TP405L
TP405R
TP406
TP408
RT405L Lch LEVEL INDICATOR
RT405R Rch LEVEL INDICATOR
RT401L Lch FM AUDIO REC LEVEL
RT401R Rch FM AUDIO REC LEVEL
RT403 DROP OUT LEVEL
RT406 EP FM AUDIO HEAD SWITCHING POINT
RT404 SP FM AUDIO HEAD SWITCHING POINT
RT402R Rch Hi-Fi AUDIO PB GAIN
RT402L Lch Hi-Fi AUDIO PB GAIN
※ONE VOLTAGE:PB OR REC MODE.
TWO VOLTAGES:PB AND (REC) MODE.
FM AUDIO P.C.B



LUMINANCE / CHROMA

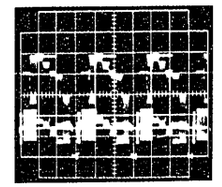


LUMINANCE / CHROMA P.C.B

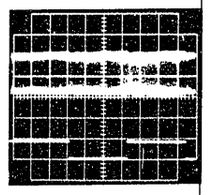
LUMINANCE/CHROMA CIRCUIT WAVEFORM

[IC201]

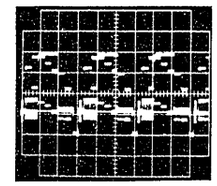
① PIN 2 REC/PB
0.2V/20 μs. div.



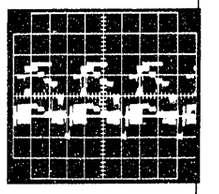
⑥ PIN 20 PB
0.2V/5 ms. div.



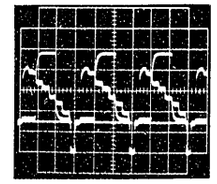
② PIN 3 REC
50 mV/20 μs. div.



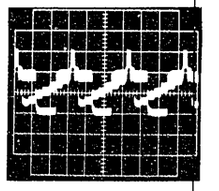
⑦ PIN 23 REC
50 mV/20 μs. div.



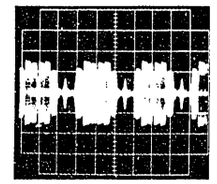
③ PIN 7 PB
0.2V/20 μs. div.



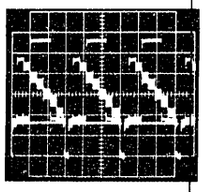
⑧ PIN 23 PB
50 mV/20 μs. div.



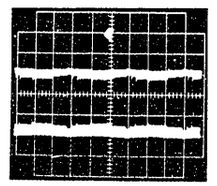
④ PIN 10 PB
50 mV/20 μs. div.



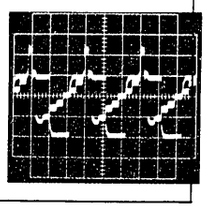
⑨ PIN 25 REC
50 mV/20 μs. div.



⑤ PIN 17 REC
0.2V/20 μs. div.

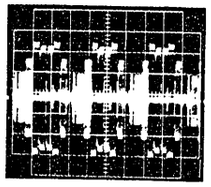


⑩ PIN 27 PB
50 mV/20 μs. div.

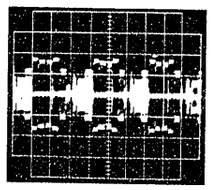


[IC202]

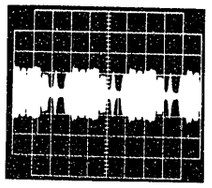
(11) PIN 7 REC
50 mV/20 μs. div.



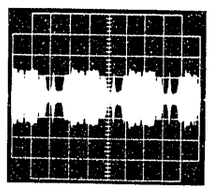
(16) PIN 15 REC
50 mV/20μ s. div.



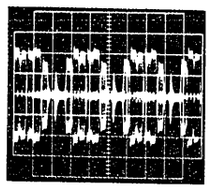
(12) PIN 7 PB
0.1V/20μ s. div.



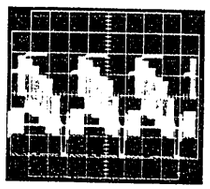
(17) PIN 15 PB
0.1V/20 μs. div.



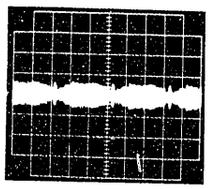
(13) PIN 9 PB
0.1V/20 μs. div.



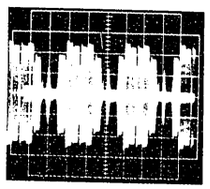
(18) PIN 17 REC
0.2V/20 μs. div.



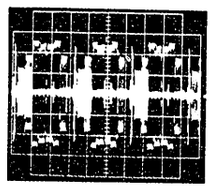
(14) PIN 11 PB
50 mV/20 μs. div.



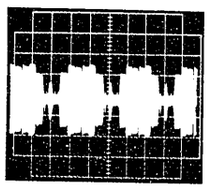
(19) PIN 19 PB
50 mV/20 μs. div.



(15) PIN 13 REC
0.1V/20 μs. div.

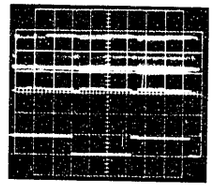


(20) PIN 21 PB
0.1V/20 μs. div.

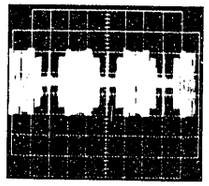


[IC203]

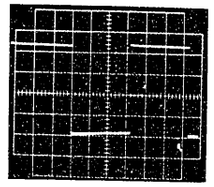
(21) PIN 3 REC
1V/5 ms. div.



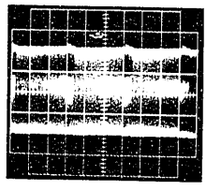
(26) PIN 25 REC
20 mV/20 μs. div.



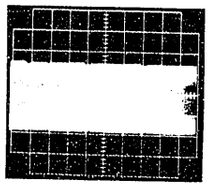
(22) PIN 15 REC/PB
1V/5 ms. div.



(27) PIN 26 REC
0.1V/20 μs. div.

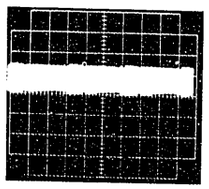


(23) PIN 19 PB
0.1V/20 μs. div.

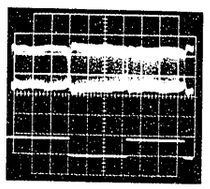


(28) PIN 28 PB
50 mV/5 ms. div.

(24) PIN 20 PB
50 mV/20 μs. div.

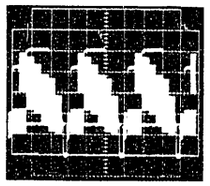


(25) PIN 23 PB
50 mV/5 ms. div.

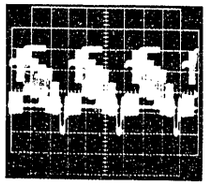


[IC204]

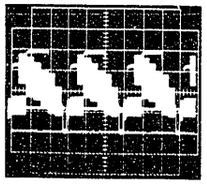
(29) PIN 3 REC/PB
0.2V/20 μs. div.



(30) PIN 5 REC/PB
0.5V/20 μs. div.

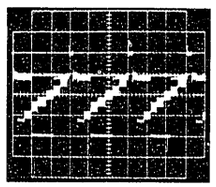


(31) PIN 6 REC/PB
0.2V/20 μs. div.

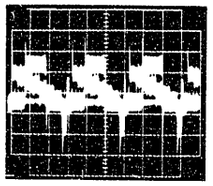


[IC301]

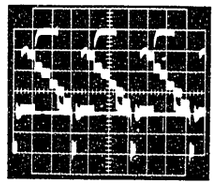
(32) PIN 1 REC
0.1V/20 μs. div.



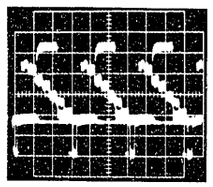
(37) PIN 12 PB
0.1V/20 μs. div.



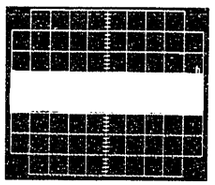
(33) PIN 1 PB
50 mV/20 μs. div.



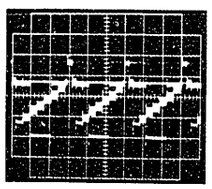
(38) PIN 14 PB
50 mV/20 μs. div.



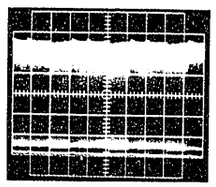
(34) PIN 5 PB
20 mV/20 μs. div.



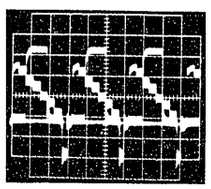
(39) PIN 15 REC
0.1V/20 μs. div.



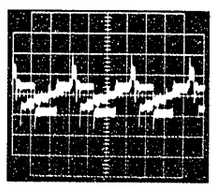
(35) PIN 9 PB
0.2V/20 μs. div.



(40) PIN 15 PB
50 mV/20 μs. div.

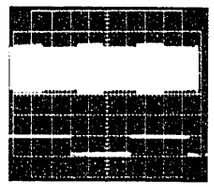


(36) PIN 11 PB
20 mV/20 μs. div.

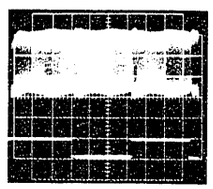


[TEST POINT]

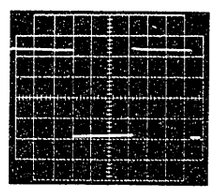
(41) TP202 REC
50 mV/5 ms. div.



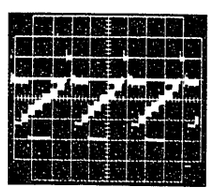
(42) TP203 PB
50 mV/5 ms. div.



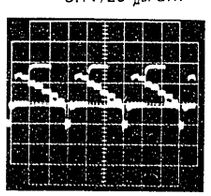
(43) TP204 REC/PB
1V/5 ms. div.

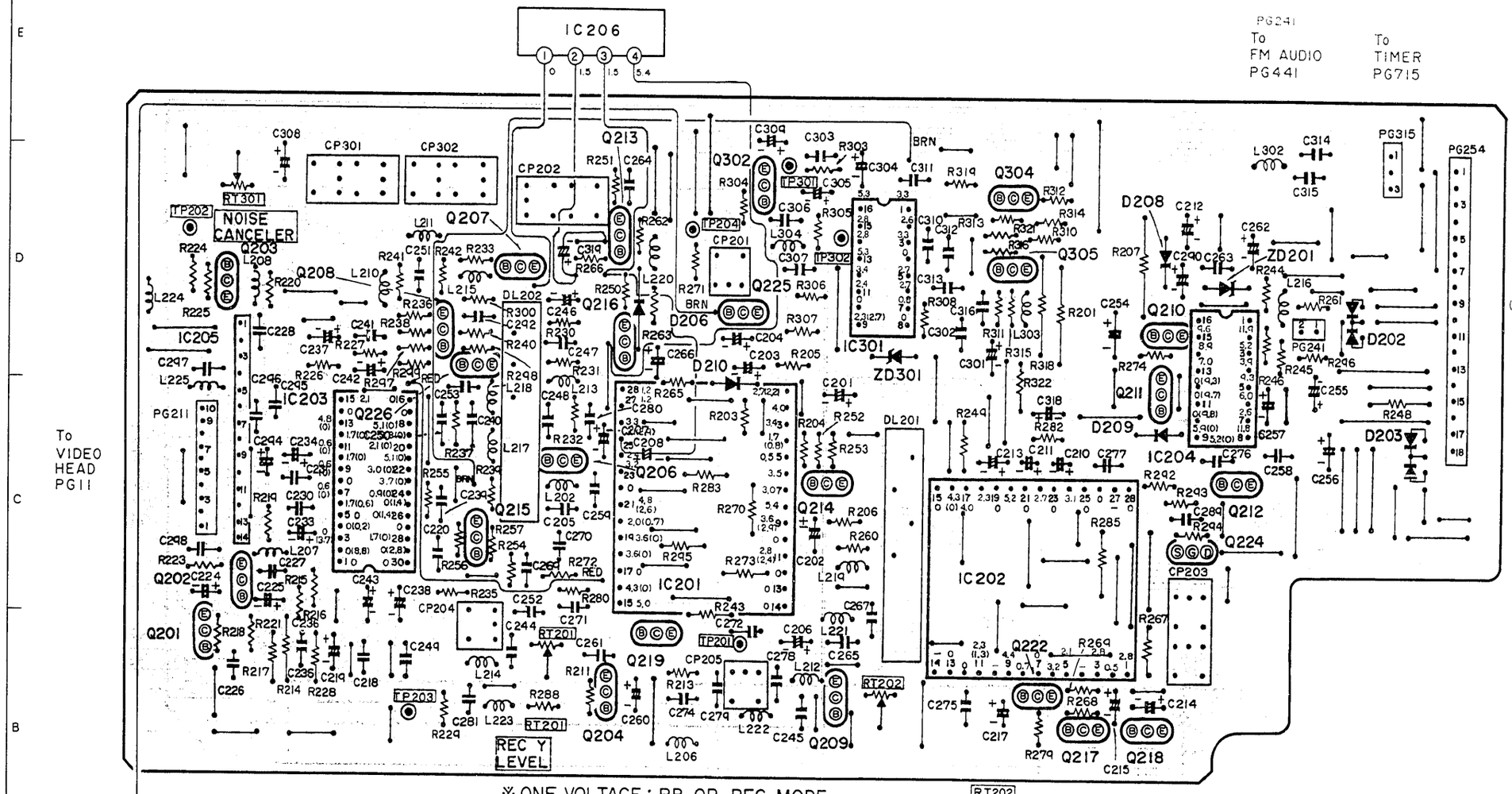


(44) TP301 REC
0.1V/20 μs. div.

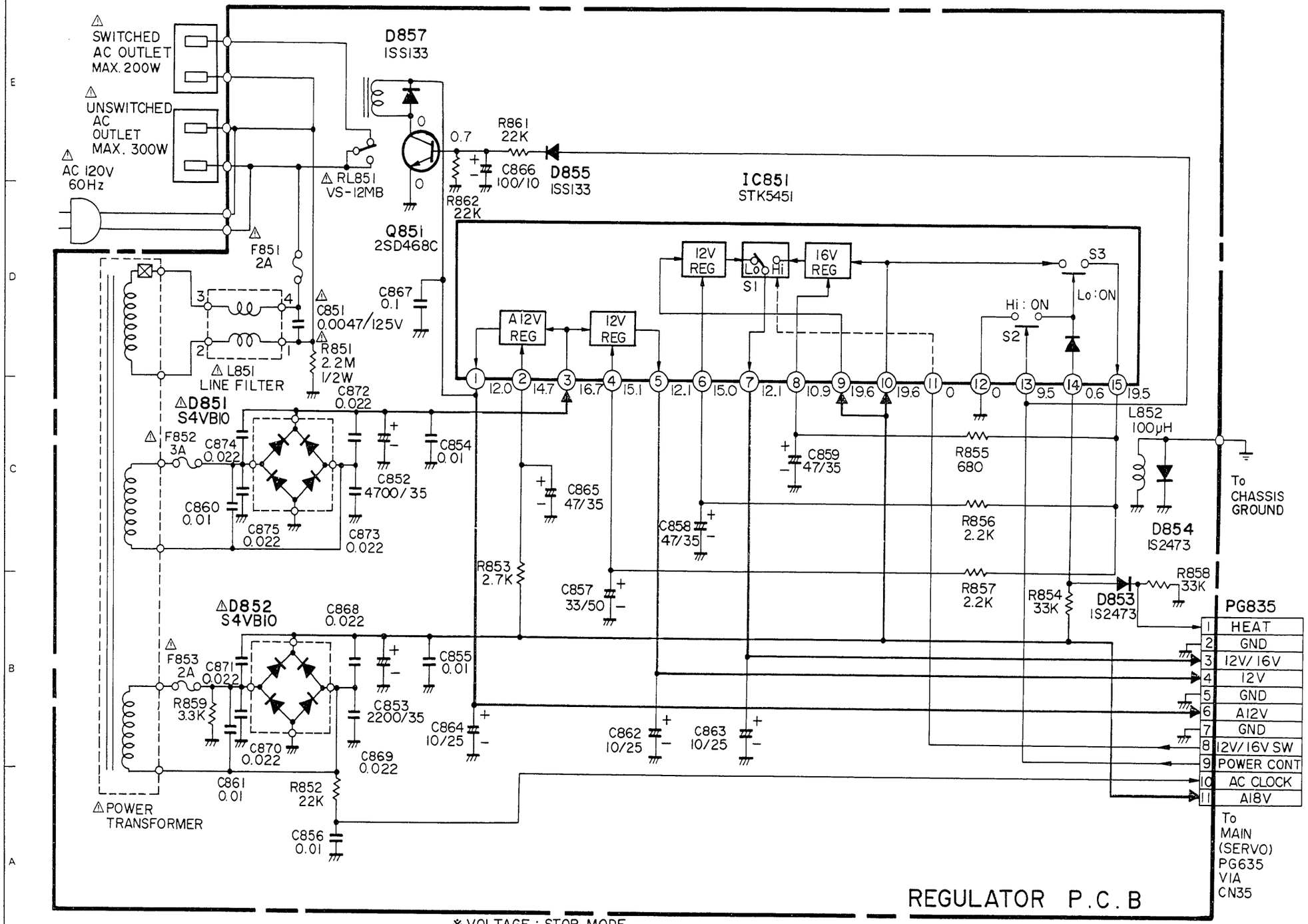


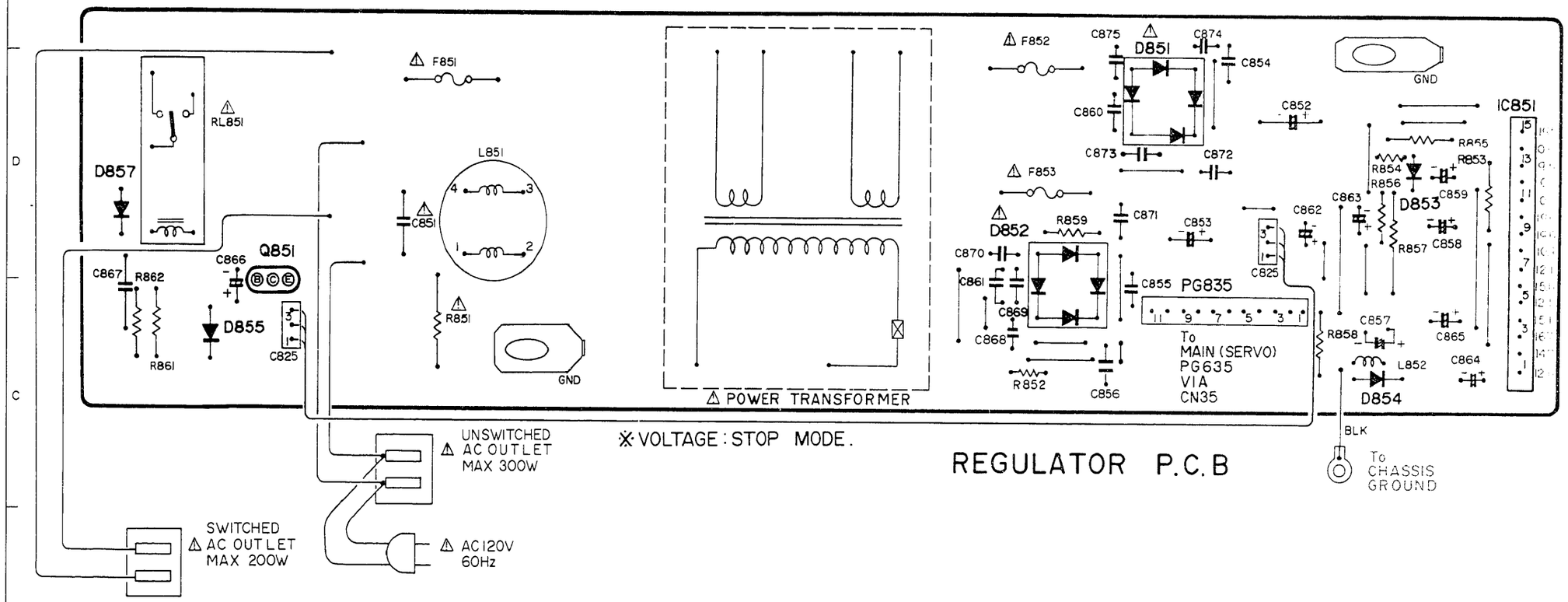
(45) TP301 PB
0.1V/20 μs. div.




IC206
PG241
To
FM AUDIO
PG441
To
TIMER
PG715
To
MAIN
(REAR JACK)
PG554
To
VIDEO
HEAD
PG11
NOISE
CANCELER
REC Y
LEVEL
RT202
REC CHROMA
LEVEL
CN237 To
MAIN (REAR JACK)
CN537
※ ONE VOLTAGE : PB OR REC MODE.
TWO VOLTAGES : PB AND (REC) MODES.
LUMINANCE / CHROMA P.C.B
LUMINANCE/CHROMA 5-53 5-54 LUMINANCE/CHROMA

REGULATOR


⚠ SWITCHED AC OUTLET MAX. 200W
⚠ UNSWITCHED AC OUTLET MAX. 300W
⚠ AC 120V 60Hz
⚠ RL851 VS-12MB
D857 ISS133
R861 22K
C866 100/10
D855 ISS133
R862 22K
Q851 2SD468C
IC851 STK5451
⚠ F851 2A
C867 0.1
⚠ C851 0.0047/125V
⚠ R851 2.2M 1/2W
⚠ L851 LINE FILTER
C872 0.022
⚠D851 S4VB10
⚠ F852 3A
C874 0.022
C875 0.022
C860 0.01
C852 4700/35
C873 0.022
C854 0.01
C865 47/35
R853 2.7K
C857 33/50
⚠D852 S4VB10
C868 0.022
⚠ F853 2A
C871 0.022
R859 3.3K
C870 0.022
C853 2200/35
C869 0.022
C855 0.01
C864 10/25
C861 0.01
R852 22K
C856 0.01
⚠ POWER TRANSFORMER
12V REG
Lo Hi
S1
16V REG
S3
Lo:ON
Hi : ON
S2
A12V REG
12V REG
C858 47/35
C859 47/35
C862 10/25
C863 10/25
R855 680
R856 2.2K
R857 2.2K
R854 33K
D853 IS2473
R858 33K
D854 IS2473
L852 100μH
To CHASSIS GROUND
PG835
1 HEAT
2 GND
3 12V/16V
4 12V
5 GND
6 A12V
7 GND
8 12V/16V SW
9 POWER CONT
10 AC CLOCK
11 A18V
To MAIN (SERVO) PG635 VIA CN35
REGULATOR P.C.B
※ VOLTAGE : STOP MODE.



※ VOLTAGE : STOP MODE.

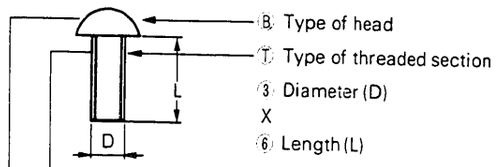
REGULATOR P.C.B

CHAPTER 6

PARTS AND EXPRODED VIEWS

SCREW CLASSIFICATION

Example: BT3 × 6



Abbre-viation	Name	Shape
No symbol	Brazier head	
P	Pan head	
B	Binding head	
O	Oval countersunk head	
F	Flat countersunk head	

Abbre-viation	Name	Shape
No symbol	Machine (clamps without tapping)	
t	Tapping (clamps with tapping) Type 1	
T	Tapping (clamps with tapping) Type 2	
f	Forming tight (for metal)	

Note Since the forming tight screw tightens while self-tapping machine screws can be replaced by tapping screws.

Washers and Nuts

Abbre-viation	Name	Shape
W	Washer	
SW	Spring washer	
LW	Locking washer	
E	E-ring	
N	Nut	

Note Internal dia is indicated for nuts and washers.

LUBRICATION

Lubrication points are shown in the exploded view diagrams by marks (Ⓢ, Ⓗ)

Lubricants shown in the diagram are as follows.

Ⓢ Sonic slider oil (≒ 1600)

Ⓗ Hitazol (MO-138)

REPLACEMENT PARTS LIST

ELECTRICAL PARTS

SYMBOL-NO	P-NO	DESCRIPTION
		CAPACITORS
C 634	0256472	CAPACITOR 2.2UH 20V
C 657	0256473	CAPACITOR 4.7UH 16V
		RESISTORS
R 201	0171015	METALFILM 680HM+-5% 1W
R 207	0171016	METALFILM 820HM+-5% 1W
R 359	0170472	FUSE RESISTOR 3.30HM+-5% 1/4W
R 529	0170479	FUSE RESISTOR 6.80HM+-5% 1/4W
R 591	0171016	METALFILM 820HM+-5% 1W
R 616	0149705	RESISTOR METAL OXIDE 4700HM
R 682	0111039	OXIDE METAL FLIM 1500HM+-5% 1W
R 851	0134704	COMPOSITION RESISTOR 2.2M OHM +-10% 1/2G
RA 101	5378891	RESISTOR BLOCK
RT 099	5007464	SEMI VARIABLE 47KOHM
RT 201	5007185	SEMI VARIABLE RESISTOR 4.7KOHM
RT 202	5007184	SEMI VARIABLE RESISTOR 2.2KOHM
RT 301	5007183	SEMI VARIABLE RESISTOR 1KOHM
RT 401L	5007183	SEMI VARIABLE RESISTOR 1KOHM
RT 401R	5007183	SEMI VARIABLE RESISTOR 1KOHM
RT 402L	5007187	SEMI VARIABLE RESISTOR 22KOHM
RT 402R	5007187	SEMI VARIABLE RESISTOR 22KOHM
RT 403	5007188	SEMI VARIABLE RESISTOR 47KOHM
RT 404	5007228	SEMI VARIABLE 220K OHM
RT 405L	5007186	SEMI VARIABLE RESISTOR 10KOHM
RT 405R	5007186	SEMI VARIABLE RESISTOR 10KOHM
RT 406	5007228	SEMI VARIABLE 220K OHM
RT 501L	5007437	SEMI VARIABLE 47KOHM
RT 501R	5007437	SEMI VARIABLE 47KOHM
RT 502L	5007439	SEMI VARIABLE 220KOHM
RT 502R	5007439	SEMI VARIABLE 220KOHM
RT 601	5007438	SEMI VARIABLE 100KOHM
RT 602	5007438	SEMI VARIABLE 100KOHM
RT 603	5007437	SEMI VARIABLE 47KOHM
RT 604	5007439	SEMI VARIABLE 220KOHM
RT 606	5007437	SEMI VARIABLE 47KOHM
RT 607	5007439	SEMI VARIABLE 220KOHM
RV 101	5001132	VARIABLE RESISTOR 10KOHM
RV 751	5005451	VARIABLE RESISTOR 50KOHM(B)
RV 753	5005452	VARIABLE RESISTOR 1KOHM
RV 754	5001133	VARIABLE RESISTOR 20KOHM
RV 755	5027223	VARIABLE RESISTOR 100KOHM
		SEMI-CONDUCTORS
D 099	5331592	DIODE 1SS133
D 202	5331511	DIODE DAN201
D 203	5331511	DIODE DAN201
D 206	5331051	DIODE 1K60P
D 208	5339021	1SS133T
D 209	5339021	1SS133T
D 210	5339021	1SS133T
D 353	5339021	1SS133T
D 354	5339021	1SS133T
D 401L	5339021	1SS133T
D 401R	5339021	1SS133T
D 402L	5339021	1SS133T
D 402R	5339021	1SS133T
D 403	5339021	1SS133T
D 405	5339021	1SS133T
D 407	5339021	1SS133T
D 408	5339021	1SS133T
D 410	5339021	1SS133T
D 411	5339021	1SS133T
D 412	5339021	1SS133T
D 413	5339021	1SS133T
D 414	5339021	1SS133T
D 415	5339021	1SS133T
D 416	5339021	1SS133T
D 418	5331592	DIODE 1SS133
D 501	5339021	1SS133T
D 502	5339021	1SS133T
D 554	5339021	1SS133T
D 556	5339021	1SS133T
D 557	5339021	1SS133T
D 558	5339021	1SS133T
D 559	5339021	1SS133T
D 560	5339021	1SS133T
D 601	5331591	DIODE 1SS133HV
D 602	5331591	DIODE 1SS133HV
D 604	5339021	1SS133T
D 605	5339021	1SS133T
D 606	5339021	1SS133T
D 607	5339021	1SS133T
D 608	5331511	DIODE DAN201
D 609	5339021	1SS133T
D 610	5331591	DIODE 1SS133HV
D 611	5339021	1SS133T
D 614	5331591	DIODE 1SS133HV
D 616	5339021	1SS133T
D 617	5331591	DIODE 1SS133HV
D 618	5331591	DIODE 1SS133HV
D 619	5331591	DIODE 1SS133HV
D 620	5331591	DIODE 1SS133HV
D 621	5331591	DIODE 1SS133HV
D 622	5331591	DIODE 1SS133HV
D 623	5331591	DIODE 1SS133HV
D 624	5331591	DIODE 1SS133HV
D 625	5331591	DIODE 1SS133HV
D 637	5339021	1SS133T
D 651	5339021	1SS133T
D 652	5339021	1SS133T
D 656	5331591	DIODE 1SS133HV
D 680	5339021	1SS133T
D 699	5331592	DIODE 1SS133
D 759	5339021	1SS133T
D 760	5339021	1SS133T
D 761	5339021	1SS133T
D 762	5339021	1SS133T
D 763	5339021	1SS133T
D 771	5339002	DIODE 1S2076
D 772	5339002	DIODE 1S2076
D 773	5339002	DIODE 1S2076
D 774	5339002	DIODE 1S2076
D 775	5339002	DIODE 1S2076
D 776	5339002	DIODE 1S2076

SYMBOL-NO	P-NO	DESCRIPTION
		SEMI-CONDUCTORS
D 777	5339002	DIODE 1S2076
D 778	5339002	DIODE 1S2076
D 779	5339002	DIODE 1S2076
D 780	5339002	DIODE 1S2076
D 781	5339002	DIODE 1S2076
D 782	5339002	DIODE 1S2076
D 783	5339002	DIODE 1S2076
D 784	5339021	1SS133T
D 785	5339021	1SS133T
D 788	5381211	LED SEL2213C
D 790	5381211	LED SEL2213C
D 791	5381211	LED SEL2213C
D 792	5381211	LED SEL2213C
D 795	5381214	LED SEL2413E
D 801	5339002	DIODE 1S2076
D 802	5339021	1SS133T
D 806	5339021	1SS133T
D 807	5330135	DIODE 1S2076A
D 808	5330135	DIODE 1S2076A
D 809	5339021	1SS133T
D 810	5339021	1SS133T
D 851	5331521	DIODE S4VB10
D 852	5331521	DIODE S4VB10
D 853	5330573	DIODE 1S2473
D 854	5330573	DIODE 1S2473
D 855	5331592	DIODE 1SS133
D 857	5331592	DIODE 1SS133
D 901	5332192	DIODE ERB12-02
D 902	5332192	DIODE ERB12-02
D 903	5339021	1SS133T
D 904	5339021	1SS133T
D 905	5339021	1SS133T
D 906	5330133	DIODE SILICON 1S2076 100MHZ 250MW
D 907	5339021	1SS133T
D 908	5339021	1SS133T
D 909	5339021	1SS133T
D 910	5339021	1SS133T
D 941	5331511	DIODE DAN201
D 942	5331511	DIODE DAN201
D 943	5331511	DIODE DAN201
D 944	5331511	DIODE DAN201
D 98	5339021	1SS133T
IC 098	5362741	IC BU4011B
IC 099	5366581	IC BA6303
IC 101	5369181	IC M5218L
IC 142	5391032	HOLEIC DN6838A
IC 200	5378641	IC HT4541
IC 202	5377562	IC HT4506A
IC 203	5364881	IC HA11797NT
IC 204	5364631	IC EWA 127
IC 205	5374302	IC HT4438A
IC 206	5370031	IC HT4468
IC 301	5364651	IC HA11787
IC 351	5364971	IC TK 15021Z
IC 401	5364881	IC HA11797NT
IC 402	5374053	IC HT6210B
IC 403	5364923	IC HA12072ANT
IC 404	5364971	IC TK 15021Z
IC 405	5350604	IC NJM-4558S
IC 406	5352791	IC TA7324P
IC 407	5364601	IC M5278L-05
IC 408	5369431	IC LA7016
IC 409	5364601	IC M5278L-05
IC 501L	5355751	IC BA5102AL
IC 501R	5355751	IC BA5102AL
IC 502L	5364201	IC UPC1513HA
IC 502R	5364201	IC UPC1513HA
IC 551	5362931	IC M50760-670P
IC 601	5364911	IC HA13430A
IC 602	5350961	IC BA340
IC 603	5369914	IC M54648L-C
IC 604	5366401	IC HA11837
IC 606	5350604	IC NJM-4558S
IC 751	5362914	IC M50757-692SP
IC 752	5355262	IC MPC1373HA
IC 801	5362862	IC M50161-251SP
IC 802	5361071	IC M58657P
IC 803	5355611	IC LA7910
IC 851	5353591	IC STK5451
IC 901	5362883	IC HD38820L38
IC 902	5364091	IC M54549L
IC 903	5364602	IC M5278L-56
IC 971	5376912	IC TA4390A
Q 098	5321663	TRANSISTOR 2SC2021RS
Q 099	5321663	TRANSISTOR 2SC2021RS
Q 141	5381681	PHOTO TRANSISTOR PT-23F-F
Q 142	5381682	PHOTO TRANSISTOR PT-23F-HLD
Q 201	5323903	TRANSISTOR 2SC1740RS
Q 202	5323903	TRANSISTOR 2SC1740RS
Q 203	5323903	TRANSISTOR 2SC1740RS
Q 204	5323903	TRANSISTOR 2SC1740RS
Q 206	5323903	TRANSISTOR 2SC1740RS
Q 207	5321255	TRANSISTOR 2SA844CD
Q 208	5323903	TRANSISTOR 2SC1740RS
Q 209	5323561	TRANSISTOR DTC124F
Q 210	5323903	TRANSISTOR 2SC1740RS
Q 211	5323903	TRANSISTOR 2SC1740RS
Q 212	5323903	TRANSISTOR 2SC1740RS
Q 213	5323903	TRANSISTOR 2SC1740RS
Q 214	5323903	TRANSISTOR 2SC1740RS
Q 215	5323903	TRANSISTOR 2SC1740RS
Q 216	5323903	TRANSISTOR 2SC1740RS
Q 217	5321255	TRANSISTOR 2SA844CD
Q 218	5321255	TRANSISTOR 2SA844CD
Q 219	5323903	TRANSISTOR 2SC1740RS
Q 222	5323903	TRANSISTOR 2SC1740RS
Q 224	5324051	TRANSISTOR 2SK301QR
Q 225	5323561	TRANSISTOR DTC124F
Q 226	5323903	TRANSISTOR 2SC1740RS
Q 302	5323903	TRANSISTOR 2SC1740RS
Q 304	5321255	TRANSISTOR 2SA844CD
Q 305	5323903	TRANSISTOR 2SC1740RS
Q 351	5327011	TRANSISTOR 2SC1740RS
Q 352	5323562	TRANSISTOR DTA124F

SYMBOL-NO	P-NO	DESCRIPTION
		SEMI-CONDUCTORS
Q 353	5323562	TRANSISTOR DTA124F
Q 401	5321662	TRANSISTOR 2SC2021S
Q 402	5327011	TRANSISTOR 2SC1740RS
Q 403	5323903	TRANSISTOR 2SC1740RS
Q 404	5327011	TRANSISTOR 2SC1740RS
Q 405	5322216	TRANSISTOR 2SC1741QR
Q 406	5322216	TRANSISTOR 2SC1741QR
Q 408	5323903	TRANSISTOR 2SC1740RS
Q 409	5327011	TRANSISTOR 2SC1740RS
Q 410	5327011	TRANSISTOR 2SC1740RS
Q 411	5323562	TRANSISTOR DTA124F
Q 412	5323561	TRANSISTOR DTC124F
Q 413	5323561	TRANSISTOR DTC124F
Q 418	5323561	TRANSISTOR DTC124F
Q 419	5323561	TRANSISTOR DTC124F
Q 420	5323561	TRANSISTOR DTC124F
Q 421	5322733	TRANSISTOR 2SA952ML
Q 424	5323561	TRANSISTOR DTC124F
Q 501L	5323561	TRANSISTOR DTC124F
Q 501R	5323561	TRANSISTOR DTC124F
Q 502L	5323561	TRANSISTOR DTC124F
Q 502R	5323561	TRANSISTOR DTC124F
Q 504	5323561	TRANSISTOR DTC124F
Q 505	5323561	TRANSISTOR DTC124F
Q 507	5323561	TRANSISTOR DTC124F
Q 508	5323903	TRANSISTOR 2SC1740RS
Q 509	5323561	TRANSISTOR DTC124F
Q 510	5321213	TRANSISTOR 2SD468C 190MHZ 0.9MW
Q 515	5323561	TRANSISTOR DTC124F
Q 551	5321255	TRANSISTOR 2SA844CD
Q 552	5327031	TRANSISTOR 2SA673C
Q 553	5323561	TRANSISTOR DTC124F
Q 554	5327011	TRANSISTOR 2SC1740RS
Q 555	5327011	TRANSISTOR 2SC1740RS
Q 559	5323903	TRANSISTOR 2SC1740RS
Q 560	5323903	TRANSISTOR 2SC1740RS
Q 561	5323561	TRANSISTOR DTC124F
Q 562	5323561	TRANSISTOR DTC124F
Q 563	5323561	TRANSISTOR DTC124F
Q 567	5323903	TRANSISTOR 2SC1740RS
Q 568	5323903	TRANSISTOR 2SC1740RS
Q 601	5321663	TRANSISTOR 2SC2021RS
Q 602	5321255	TRANSISTOR 2SA844CD
Q 603	5323071	TRANSISTOR 2SD947
Q 604	5323562	TRANSISTOR DTA124F
Q 606	5327021	TRANSISTOR 2SA844CD-TB
Q 613	5323561	TRANSISTOR DTC124F
Q 614	5320069	TRANSISTOR 2SC458CD
Q 615	5320593	TRANSISTOR 2SA673C
Q 630	5323561	TRANSISTOR DTC124F
Q 632	5323561	TRANSISTOR DTC124F
Q 633	5320069	TRANSISTOR 2SC458CD
Q 636	5320069	TRANSISTOR 2SC458CD
Q 637	5323562	TRANSISTOR DTA124F
Q 640	5320069	TRANSISTOR 2SC458CD
Q 641	5323562	TRANSISTOR DTA124F
Q 642	5323562	TRANSISTOR DTA124F
Q 643	5323562	TRANSISTOR DTA124F
Q 644	5323562	TRANSISTOR DTA124F
Q 645	5323562	TRANSISTOR DTA124F
Q 646	5323562	TRANSISTOR DTA124F
Q 651	5323561	TRANSISTOR DTC124F
Q 652	5323561	TRANSISTOR DTC124F
Q 699	5321255	TRANSISTOR 2SA844CD
Q 753	5321663	TRANSISTOR 2SC2021RS
Q 755	5323561	TRANSISTOR DTC124F
Q 756	5321663	TRANSISTOR 2SC2021RS
Q 757	5321663	TRANSISTOR 2SC2021RS
Q 763	5321255	TRANSISTOR 2SA844CD
Q 801	5323561	TRANSISTOR DTC124F
Q 802	5323562	TRANSISTOR DTA124F
Q 803	5323561	TRANSISTOR DTC124F
Q 804	5323463	TRANSISTOR 2SD1266A-Q
Q 805	5321663	TRANSISTOR 2SC2021RS
Q 806	5321663	TRANSISTOR 2SC2021RS
Q 807	5321255	TRANSISTOR 2SA844CD
Q 809	5323561	TRANSISTOR DTC124F
Q 810	5323561	TRANSISTOR DTC124F
Q 851	5321213	TRANSISTOR 2SD468C 190MHZ 0.9MW
Q 901	5321663	TRANSISTOR 2SC2021RS
Q 902	5321663	TRANSISTOR 2SC2021RS
Q 904	5323561	TRANSISTOR DTC124F
ZD 201	5331017	DIODE HZ-5C3
ZD 301	5331017	DIODE HZ-5C3
ZD 351	5330551	ZENNER DIODE HZ11A
ZD 551	5331017	DIODE HZ-5C3
ZD 552	5330714	DIODE HZ4B
ZD 602	5330315	ZENER DIODE HZ7C3
ZD 750	5330712	DIODE HZ3B
ZD 751	5330714	DIODE HZ4B
ZD 801	5350611	IC UPC574J
ZD 802	5330532	DIODE SILICON HZ-12B 1.0M
ZD 807	5330714	DIODE HZ4B
ZD 808	5330542	DIODE HZ15-3
ZD 809	5330542	DIODE HZ15-3
ZD 901	5330325	DIODE HZ9A2
		TRANSFORMERS
T 501	5261301	OSC.BLOCK
		COILS
L 201	5152336	CHOKE COIL 82UH+-10%
L 202	5152318	CHOKE COIL 3.9MICRO H
L 206	5152337	CHOKE COIL 100UH
L 207	5152479	CHOKE COIL 0.47MICROH
L 208	5152479	CHOKE COIL 0.47MICROH
L 210	5152337	CHOKE COIL 100UH
L 211	5152337	CHOKE COIL 100UH
L 212	5152349	CHOKE COIL 821UF
L 213	5152328	CHOKE COIL 22UH+-10%
L 214	5152342	CHOKE COIL 220UH+-10%
L 215	5152328	CHOKE COIL 22UH+-10%
L 216	5152337	CHOKE COIL 100UH
L 217	5152324	CHOKE COIL 10UH+-10%
L 218	5152324	CHOKE COIL 10UH+-10%

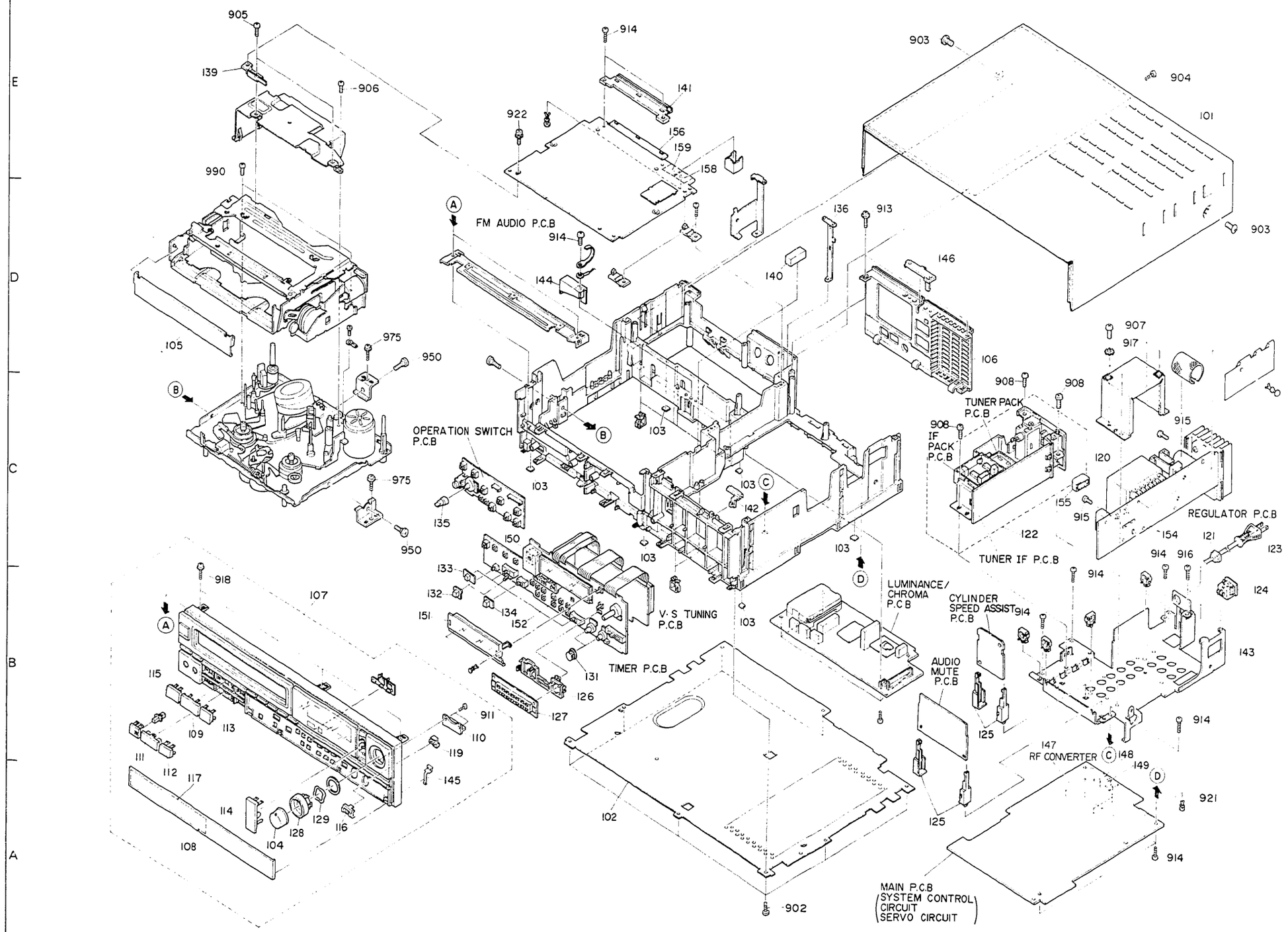
SYMBOL-NO	P-NO	DESCRIPTION
		COILS
L 219	5152333	CHOKE COIL 47MH
L 220	5152333	CHOKE COIL 47MH
L 221	5152326	CHOKE COIL 15UH
L 222	5152328	CHOKE COIL 22UH+-10%
L 223	5152333	CHOKE COIL 47MH
L 224	5152337	CHOKE COIL 100UH
L 225	5152349	CHOKE COIL 821UF
L 302	5152322	CHOKE COIL 47CMICROH
L 303	5152328	CHOKE COIL 22UH+-10%
L 304	5152333	CHOKE COIL 47MH
L 401	5159077	CHOKE COIL
L 402	5159077	CHOKE COIL
L 403	5152337	CHOKE COIL 100UH
L 404	5159077	CHOKE COIL
L 405	5150366	HOKE COIL 15MH
L 501	5150366	HOKE COIL 15MH
L 502	5120563	TRAP COIL 70KHZ
L 503	5159089	CHOKE COIL 821UH
L 601	5152349	CHOKE COIL 821UF
L 751	5120964	TRAP COIL 38KHZ
L 801	5152129	CHOKE COIL 47MICROH
L 802	5261192	OSC.COIL
L 851	5270241	LINE FILTER
L 852	5152337	CHOKE COIL 100UH
L 901	5152472	CHOKE COIL 100MICROH
		CRYSTALS
X 751	5780791	XTAL
		MISCELLANEOUS
CE 551	5781391	CERAMIC OSC.
CN 731	5883715	FLAT CABLE 10P
CN 732	5883715	FLAT CABLE 10P
CN 733	5883716	FLAT CABLE 8P
CN 734	5883713	5P MINI CONNECTOR
CP 201	5123831	TRAP FILTER
CP 202	5162322	DELAYLINE
CP 203	5162363	BAND PASS FILTER
CP 204	5123837	TRAP COIL
CP 205	5162336	HIGH PASS FILTER
CP 301	5162322	DELAYLINE
CP 302	5162341	LOW PASS FILTER
CP 401L	5162552	BAND PASS FILTER
CP 401R	5162553	BAND PASS FILTER
CP 402L	5162811	LOW PASS FILTER
CP 402R	5162811	LOW PASS FILTER
CP 403L	5162811	LOW PASS FILTER
CP 403R	5162811	LOW PASS FILTER
DL 201	5785711	DELAY LINE
DL 202	5785754	DELAY LINE
△ F 851	5721406	FUSE 125V 2A
△ F 852	5721408	FUSE
△ F 853	5721406	FUSE 125V 2A
LE 801	5781121	XTAL
PD 751	5381582	DIODE HP-5FR3
PH 601	0249794	POSITIVE THERMISTOR
PH 901	0249794	POSITIVE THERMISTOR
RL 851	5641831	RELAY
S 101	5634585	SWITCH
S 102	5634584	SWITCH
S 103	5634584	SWITCH
S 104	5634584	SWITCH
S 105	5634581	SWITCH
S 106	5634584	SWITCH
S 107	5634585	SWITCH
S 108	5634584	SWITCH
S 109	5633911	SWITCH
S 110	5633911	SWITCH
S 143	5633362	PUSH SWITCH
S 144	5633362	PUSH SWITCH
S 551	5622562	SWITCH
S 552	5622562	SWITCH
S 761	5633911	SWITCH
S 762	5633911	SWITCH
S 763	5633911	SWITCH
S 764	5633911	SWITCH
S 765	5633911	SWITCH
S 766	5633911	SWITCH
S 767	5635061	SWITCH
S 768	5635061	SWITCH
S 769	5633911	SWITCH
S 770	5633911	SWITCH
S 771	5634584	SWITCH
S 772	5633911	SWITCH
S 773	5633911	SWITCH
S 781	5633911	SWITCH
S 782	5633911	SWITCH
S 783	5633911	SWITCH
S 784	5633911	SWITCH
S 785	5633911	SWITCH
S 791	5622602	SWITCH
S 792	5624452	SWITCH
S 793	5624451	SLIDE SWITCH
S 794	5635031	PUSH SWITCH
S 795	5635031	PUSH SWITCH
S 797	5635111	SWITCH

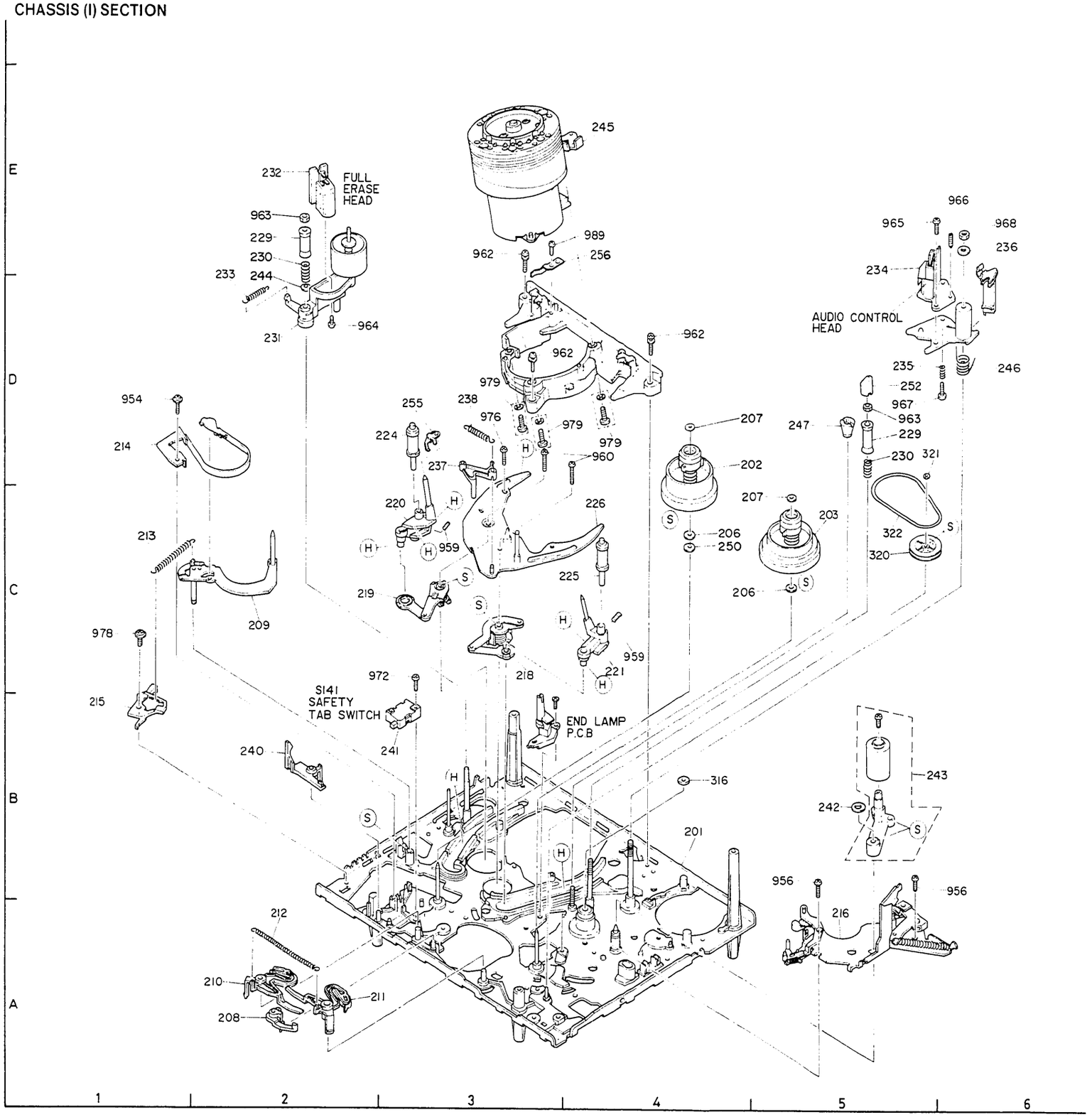
MECHANICAL PARTS
(CABINET SECTION)

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
101	6049769	TOP CASE
102	6049733	BOTTOM COVER
103	7741444	FELT (LEG)
104	6076253	KNOB
105	6644739	CASSETTE DOOR
106	6024596	COVER-REAR
107	6237015	FRONT PANEL ASSEMBLY
108	6189312	FRONT DOOR
109	6081001	BOTTON(PLAY)
110	6885461	HOLDER
111	6080993	BOTTON(F.F/REW)
112	6080981	BOTTON(PAUSE)
113	6081011	BOTTON(STOP)
114	6081121	BOTTON(CHANNEL)
115	6081021	BOTTON(RECORD)
116	6076161	KNOB
117	7692793	CHANNEL SHEET
119	6076171	KNOB
△ 120	5213752	POWER TRANSFORMER
121	6794591	BUSHING
122	5586521	TUNER IF BLOCK
△ 123	5746491	POWER CORD
△ 124	5652281	AC JACK
125	6885892	PCB HOLDER
126	6885452	LEVEL METER ASSEMBLY
127	7397082	LEVEL METER ASSEMBLY
128	6076272	MARER
129	6538412	WASHER
131	6076132	KNOB
132	6081111	BOTTON(PAUSE)
133	6076151	KNOB
134	6076141	KNOB
135	6076121	VOLUM KNOB
139	7391191	C.B.A HOLDER
140	7741814	LEG FALT
141	6884712	JACK HOLDER
142	6863963	TIMER HOLDER
143	6885621	HOLDER
144	7392691	CONNECTOR COVER
145	6538362	DOOR SPRING
146	6885481	CARD STOPER
147	5587431	RF CONVERTOR
148	6885504	HOLDER
149	5676601	JACK
150	6880841	HOLDER
151	6209801	DIG HOLDER
152	5311471	TIMER DISPLAY
△ 154	5722214	FUSE HOLDER
155	6753912	FUSE COVER
156	5672283	JACK PLATE
158	5654432	JACK PLATE
159	5653871	DIN SOCKET

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
902	8699412	BIND TAPPING SCREW-3MMD×12MM(BLACK)
903	7783072	SCREW
904	7784113	M3 SCREW
905	8741406	BIND SCREW-3MMD×6MM
906	8671406	DT SCREW-3MMD×6MM
907	7781735	SCREW 4MMD×6MM BT
908	8699410	BT BIND HEAD SCREW-3MMD×10MM(BLACK)
909	8691410	BT BIND SCREW-3MMD×10MM
911	8671408	DT BIND SCREW-3MMD×8MM
912	8691106	DT SCREW-2MMD×6MM
913	8699414	BT BIND HEAD SCREW-3MMD×14MM
914	8699410	BT BIND HEAD SCREW-3MMD×10MM(BLACK)
915	8671406	DT SCREW-3MMD×6MM
916	8691408	BIND TAPPING SCREW-3MMD×8MM(BLACK)
917	8815116	LOCK WASHER
918	7781131	B TIGHTING SCREW-3MMD×12MM
919	8699414	BT BIND HEAD SCREW-3MMD×14MM
920	6714211	NYLON RIVET-3MMD
921	6714211	NYLON RIVET-3MMD
922	7784291	SCREW

CABINET SECTION



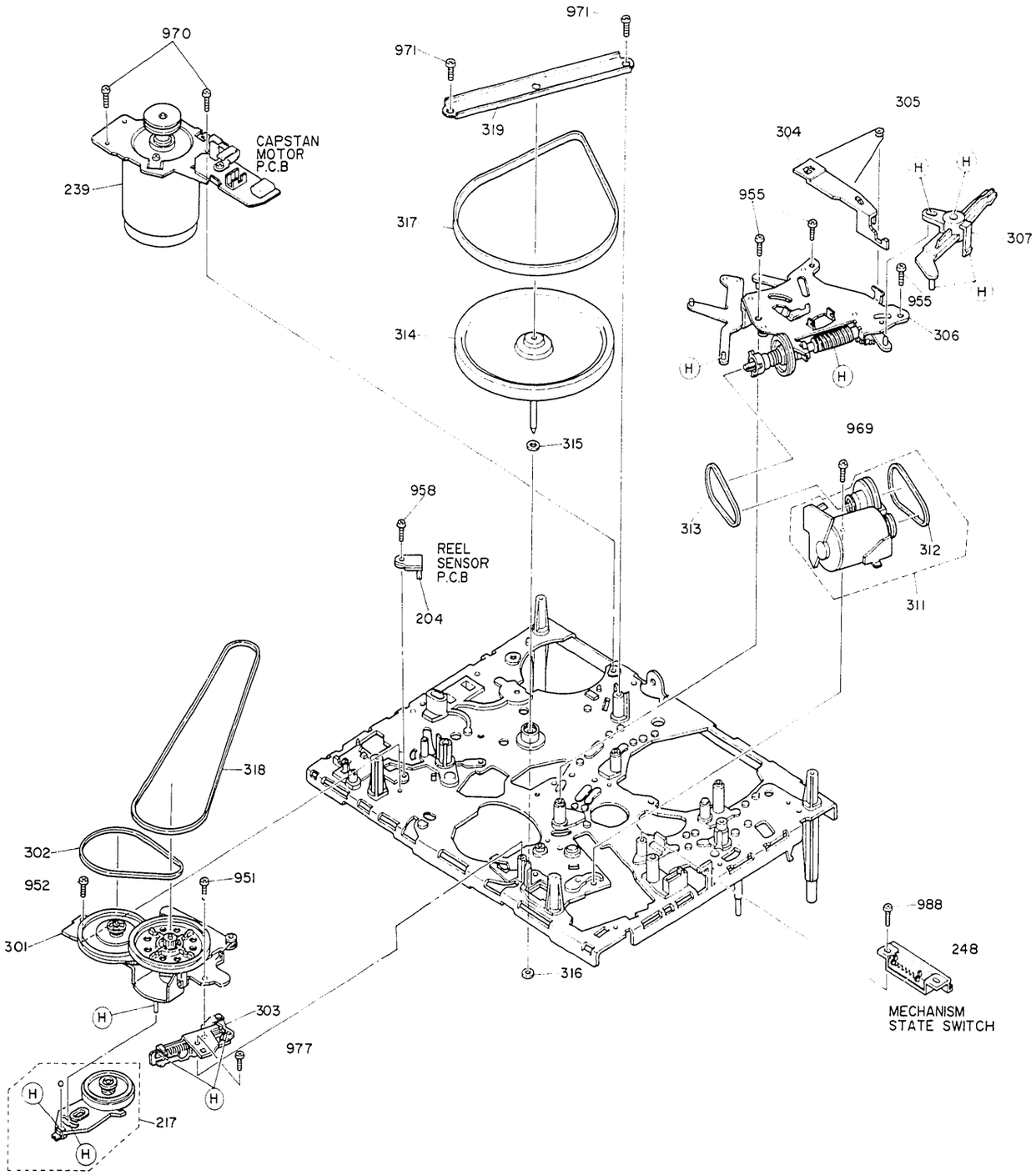


MECHANICAL PARTS (CHASSIS (I, II) SECTION)

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
202	6414654	SUPPLY REEL ASSEMBLY
203	6414674	TAKE-UP REEL ASSEMBLY
204	6871851	IC HOLDER
206	7787412	WASHER
207	7778859	POLYSLIDER WASHER
208	6865662	BRAKE ARM
209	7386841	TENSION ARM
210	6865804	BRAKE L
211	6865812	BRAKE R
212	6302471	SPRING
213	6543864	SPRING
214	7376271	TENSION BAND
215	6879421	BT.SPRING HOLDER
216	7386882	ARM BRACKET
217	6886971	FR ARM ASSEMBLY
218	7376303	LOADING LINK R ASSEMBLY
219	7376313	LOADING LINK L ASSEMBLY
221	6977588	GUIDE ROLLER BASE
220	6978301	GUIDE ROLLER BASE(I)
222	6977491	INCLINED GUIDE (TAKE-UP)
224	6344621	GUIDE ROLLER
225	6869481	GUIDE ROLLER
226	7386892	GUIDE BASE HOLDER
229	7570671	TAPE GUIDE (I)
230	6304903	SPRING
231	6879902	IMPEDANCE ARM ASSEMBLY
232	5447841	F E HEAD
233	6302391	SPRING
234	5447672	AUDIO CONTROL HEAD
235	6304906	SPRING
236	7786245	WASHER
237	6878932	SUB BRAKE
238	6300084	SPRING
239	5578152	CAPSTAN MOTOR
240	6865675	RECORDING PREVENTION ARM
241	5633971	SWITCH (S141)
242	7788143	POLYSLIDER WASHER
243	6977813	PRESSURE ROLLER ASSEMBLY
245	7380942	HOLDER (HEATER)
246	6547811	SPRING
247	6979041	X-ADJUST SCREW
248	5625091	SLIDE SWITCH
250	6873291	COLOR
255	6877521	COLLAR
256	6538171	SPRING
301	6889931	CLUCH PLATE ASSEMBLY
302	6355561	BELT
303	7386971	BRAKE SLIDER
304	6865733	MODE SLIDER
305	6547821	SPRING
306	6879484	LOADING GEAR ASSEMBLY
307	6865791	TENSION ARM
311	7386931	MOTOR
312	6356111	BELT
313	6356091	BELT
314	6979051	FLYWHEEL

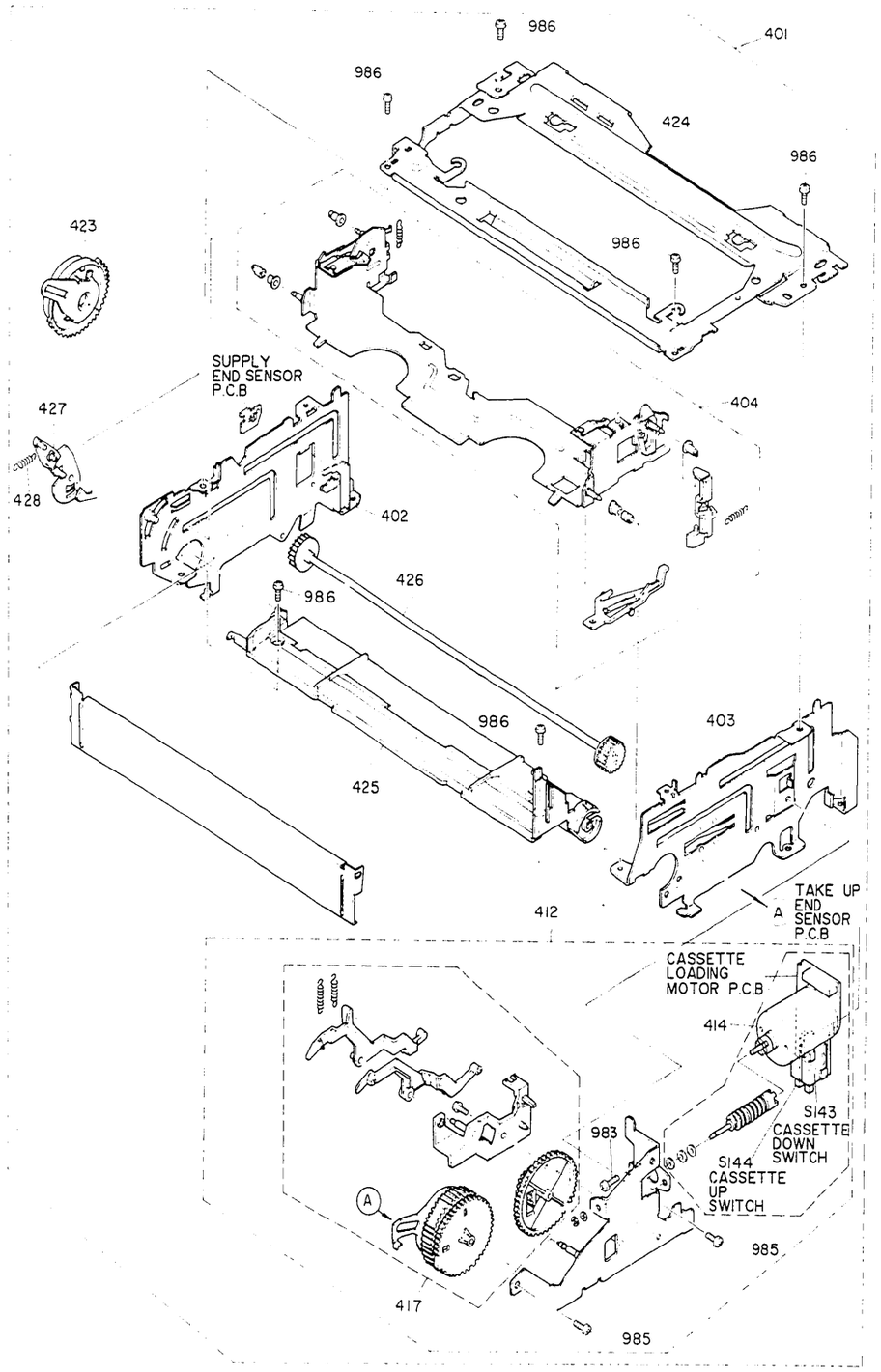
SYMBOL-NO	P-NO	DESCRIPTION
315	7788142	POLYSLIDER WASHER (THRUST)
316	7788861	WASHER
317	6356101	BELT
318	6356081	BELT
319	7386833	FLYWHEEL HOLDER
320	6869291	PULLEY
321	7778859	POLYSLIDER WASHER
322	6355561	BELT
323	0249696	POSISTOR PHT4830

CHASSIS (II) SECTION

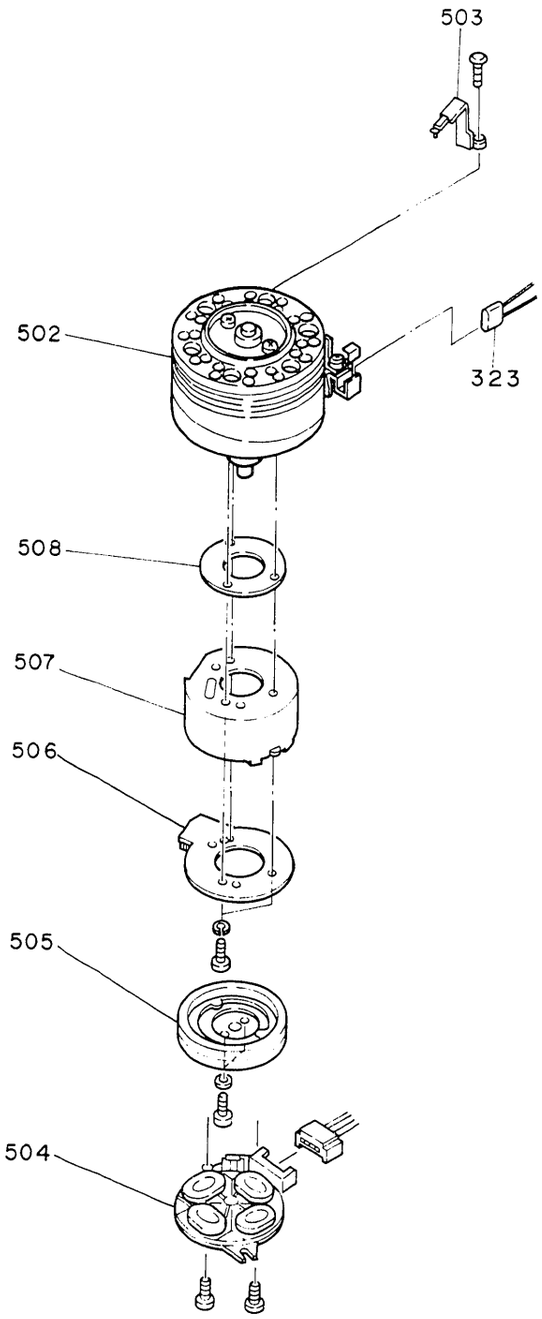


CHASSIS SECTION 6-11 6-12 CHASSIS SECTION

CASSETTE LOADING MECHANISM SECTION



CYLINDER MOTOR ASSEMBLY SECTION



MECHANICAL PARTS (CASSETTE LOADING MECHANISM/ CYLINDER MOTOR ASSEMBLY SECTION)

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
401	7396068	FRONT LOADING MECHA.ASSEMBLY
404	7386812	CASSETTE HOLDER
412	7386732	MOTOR BLOCK ASSEMBLY
414	5961871	FL.MOTOR ASSEMBLY
423	6879092	LOADING GEAR ASSEMBLY (L)
424	7386792	PLATE
425	6879051	HOLDER
426	4500401	HOLDER LINK ASSEMBLY
427	6879151	DOOR ARM
428	6301022	SPRING
502	5459841	CYL MOTOR ASSEMBLY
503	5792131	BRUSH
504	5391211	STATOR
505	5773391	ROTOR
506	5391203	CYL.FG PC BOARD
507	7393021	CASE
508	6590694	RUBBER

MECHANICAL PARTS
(FIXING SCREWS SECTION)

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
950	7541395	SPECIAL SCREW
951	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
952	8741408	SCREW (B3X8)
954	7781133	BT SCREW-3MMD
955	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
956	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
958	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
959	7773083	SCREW
960	8741408	SCREW (B3X8)
961	8651408	SCREW WITH WASHER
962	8650412	SCREW 3X12 WITH SPRING WASHER
244	8812114	WASHER-3MMD SMALL
963	8821114	3D NUT
964	8741103	SCREW(2X3B)
965	7781872	SCREW-3MMDX8MM
966	7773086	SCREW
967	8741414	BINDING SCREW - 3MMD X 14MM
968	8821114	3D NUT
969	8741408	SCREW (B3X8)
970	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
971	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
972	8691312	BT BIND SCREW-2.6MMDX12MM
975	7781131	BT SCREW 3MMDX12MM
976	7782781	SCREW 3X8BT
977	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
978	8741408	SCREW (B3X8)
979	8650408	SCREW
983	8741403	BIND SCREW-3MMDX3MM
984	8671406	DT SCREW-3MMDX6MM
985	8671406	DT SCREW-3MMDX6MM
986	8678405	DT SCREW-3MMDX5MM
988	8691410	SCREW 3MMDX10MM
989	8711103	PAN HEAD SCREW-2MMDX3MM
990	8741406	BIND SCREW-3MMDX6MM
991	8741406	BIND SCREW-3MMDX6MM
992	7541392	SCREW
		FOR ACCESSARIES
	5893172	FEEDER CABLE
	5855194	CABLE
	5761052	BATTERY
	5638452	REMOTE HAND SET
	5687871	300-75 OHM VHF ANTENNA ADAPTOR
	5687572	MACHING BOX
	6865082	DRIVER

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